PROGRAMMABLE THERMOFLO

TF 200, TF 200E Units
TF 500, TF 500E Systems

OPERATION &

MAINTENANCE

MANUAL

MANUAL NO. 5050-0420

REV. C

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For any questions regarding this Operation & Maintenance Manual, contact your local authorized PACE distributor or contact PACE directly at the appropriate address listed below.

PACE USA
9893 Brewers Court
Laurel, Maryland 20723-1990
Tel.: (301) 490-9860
(888) 535-7223 (PACE)
Fax (301) 498-3252

PACE EUROPE
Sherbourne House, Sherbourne Drive
Tilbrook, Milton Keynes
MK7 8HX
United Kingdom
Tel.: (44)1908 277666
Fax: (44)1908 277777

or

www.paceworldwide.com

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General Information

Use Of This Manual

The information contained in this manual will provide the user with the knowledge necessary to properly operate and maintain the PACE Programmable ThermoFlo Unit. To fully utilize the features of the system, PACE strongly recommends that the user read and fully understand the "Process Development" and "Operation" portions of this manual. If you encounter any difficulty operating your system, call your local authorized PACE dealer or contact PACE Customer Support directly at Tel. (301) 490-9860 or FAX (301) 604-8782.

THERMOFLO QUICK START

The ThermoFlo Unit is easy to operate and can be quickly set up for use in Manual mode or Timed mode of operation. **To begin operation of your new unit quickly, perform the Set-Up and Quick Start procedures detailed on pages 10-21 of this manual.** The Quick Start section of this manual provides condensed procedures for using the Manual or Timed modes of operation. Also detailed in the Quick Start section is a quick reference flow chart to use in the Program Mode when utilizing rework profiles developed and stored in unit memory by your company.

Introduction

This manual will provide you with the information necessary to properly set up, operate and maintain the ThermoFlo Unit. Please read this manual thoroughly before using the unit. The ThermoFlo unit is a complete system designed for hot air removal and installation of SMD components, including Ball Grid Arrays (BGAs). The following key features allow process controlled placement and reflow of BGAs and SMD components.

ThermoFlo Handpiece

The user-friendly ThermoFlo static-safe handpiece incorporates a powerful heater and has easy-access heat cycle and vacuum pick switches on the handle. A built-in, self-adjusting vacuum pick has a push-pull action, allowing components to be lifted automatically after solder reflow. When utilized with the ThermoFlo System work platform, the handpiece is easily converted to a precision reflow head.

Microprocessor Control

Precision control of temperature (closed-loop control),cycle time (adjustable in one second increments) and blower speed provides consistent, repeatable results in successive reflow operations. Utilizing the Quiet Flo (low noise) turbine blower, pressure/flow rate is easily controlled and maintained at optimum levels for the particular task at hand. A multi-level password lock-out prevents unauthorized changes and an audible countdown timer indicates end of cycle.

Multi-Mode Operation

Manual Mode - For fast and simple hand-held installations and removals.

Timed Mode -For process control with user-specified cycle time and automatic vacuum pick-up operation.

Program Mode - For full process control. Eighty (80) user-defined profiles including parameters for preheat, soak, reflow and ramp-down zones for individual component/boards may be stored in microprocessor memory.

Nozzles

PACE's exclusive QuickFit nozzle attachment system allow quick easy change out of any nozzle. A wide range of inexpensive, standard nozzles are available. Custom design nozzles are also available.

Process Control

The ThermoFlo Profile Control Chart (page 24) and Profile Log (page 25) have been created to aid in the development of customized reflow processes for your particular SMD tasks. Up to 80 user-defined profiles may be stored in microprocessor memory for use in the Program Mode.

Optional Accessories

Lighting, Vision Systems, Fume Extraction a thermocouple meter and a PACE Heat Wave preheating system and a large board holder are available options to the system.

The PACE ThermoFlo unit meets all applicable EOS/ESD and other government and industry specification requirements (including MIL-STD-2000 and ANSI-J-STD-001) for high performance and safety.

Specifications

The ThermoFlo unit is available in either the 115 VAC or 230 VAC version. The 115 VAC version system bears the FCC Conformity Marking which assures the user that it conforms to all the requirements of FCC Emission Control Standard, Title 47, Subpart B, Class A. The 230 VAC version system bears the CE Conformity Marking which assures the user that it conforms to all the requirements of (EU) directive EMC 89/336/EEC & 73/23/EEC.

Available ThermoFlo Configurations

TF 200 Unit -	Utilizes PPS 95 Power Source (115VAC) plus tools and accessories.
TF 200E Unit -	Utilizes PPS 95E Power Source (230VAC) plus tools and accessories.
TF 500 System -	Utilizes PPS 95 Power Source (115VAC), work platform, board holder, tools and accessories.
TF 500E System -	Utilizes PPS 95E Power Source (230VAC),work platform, board holder, tools and accessories.

Power Requirements

PPS 95 Power Source (115 VAC version)	-	Operates on 97-127 VAC, 60 Hz 575 Watts maximum at 120 VAC, 60 Hz
PPS 95E Power Source (230 VAC version)	-	Operates on 197-264 VAC, 50 Hz 575 Watts maximum at 230 VAC, 50 Hz

Air Temperature Range - 93°C - 427°C (200°F - 800°F)

Timing Control - 10 to 999 seconds with 1 second resolution. (does not include preheat time)

Blower Air Flow Rate (measured at heater) - 25 SLPM (0.9 SCFM) minimum at maximum speed (9).

Blower Life & Operation - 1500 hours minimum when operated with duty cycle of 3 minutes on/3 minutes off.

NOTE

The ThermoFlo is designed for cyclical useage. Attempts to use in continuous operations by taping the handpiece Cycle Switch or other methods will void Blower Assembly warranty.

Component Capacity - (maximum size) - 5.1 cm x 5.1 cm (2” x 2”)

Physical Parameters

Size - 135 mm H x 165 mm W x 260 mm D (5.3” H x 6.5” W x 9.25” D)

Unit Weight - 4.5 Kg. (9.8 lbs.)

Product Application

This product is very versatile and may be used to satisfy a variety of application requirements. If you require assistance in the use of this product with your particular application, contact your local authorized PACE distributor or contact PACE (See page iv).

Parts Identification

FRONT PANEL

1. **CYCLE LIGHT** - LED flashes Green when air flow cycle is on.
2. **VACUUM LIGHT** - LED illuminates Red when vacuum is on.
3. **MANUAL MODE LIGHT** - LED illuminates Red when unit is in the Manual mode of operation.
4. **TIMED MODE REMOVE LIGHT** - LED illuminates Red when unit is in the Timed Remove mode of operation. Also illuminates in Program Mode if selected profile is a removal process.
5. **TIMED MODE INSTALL LIGHT** - LED illuminates Red when unit is in the Timed Install mode of operation. Also illuminates in Program Mode if selected profile is an installation process.
6. **PROGRAM MODE LIGHT** - LED illuminates Red when unit is in the Program mode of operation.
7. **CYCLE KEY** - Starts air flow through the heater initiating the reflow cycle in Manual and Timed Modes and deactivates the air flow when pushed during a reflow cycle. Also initiates selected rework Profile when in Program Mode.
8. **TEMPERATURE SCROLL UP KEY** - Increases the Set Temperature in one, then ten degree (if key is held down) increments.
9. **TEMPERATURE SCROLL DOWN KEY** - Decreases the Set Temperature in one, then ten degree (if key is held down) increments.
10. **BLOWER SPEED SCROLL UP KEY** - Increases the blower speed in increments of one.
11. **BLOWER SPEED SCROLL DOWN KEY** - Decreases the blower speed in increments of one.
12. **CYCLE TIME SCROLL UP KEY** - Increases the cycle time in one, then ten second (if key is held down) increments.
13. **CYCLE TIME SCROLL DOWN KEY** - Decreases the cycle time in one, then ten second (if key is held down) increments.
14. **PROGRAM KEYPAD** - Allows entry of process control parameters and selection of up to 80 user-defined process control profiles. Individual key functions are:
    a) **Numbered Keys** - Allow entry of numerical parameters plus profile selection in Program Mode.
    b) **1/YES & 3/NO Keys** - Allows entry of numerical parameters, profile selection and Yes or No answers to Digital Readout questions when in the Program Mode.
    c) **EDIT Key** - Allows editing of current profile displayed on Digital Readout.

d) **RECALL Key** - Allows a stored profile (stored in memory) to be displayed on Digital Readout.

e) **SAVE Key** - Allows a new, user defined profile to be stored in memory.

f) **STEP Key** - Advances the user to the next step in the programming sequence. Also allows the user to step through all stored profiles.

g) **BACK Key** - Backs the user up to the previous step in the programming sequence. Also allows the user to step back through profiles stored in memory.

h) **ENTER Key** - Performs storage of profile at the end of the programming sequence.

15. **MODE/ESC KEY** - Steps through the modes of operation and is used as an escape key when editing process control profiles.

16. **DIGITAL READOUT** - A 2 line LCD display of system information.

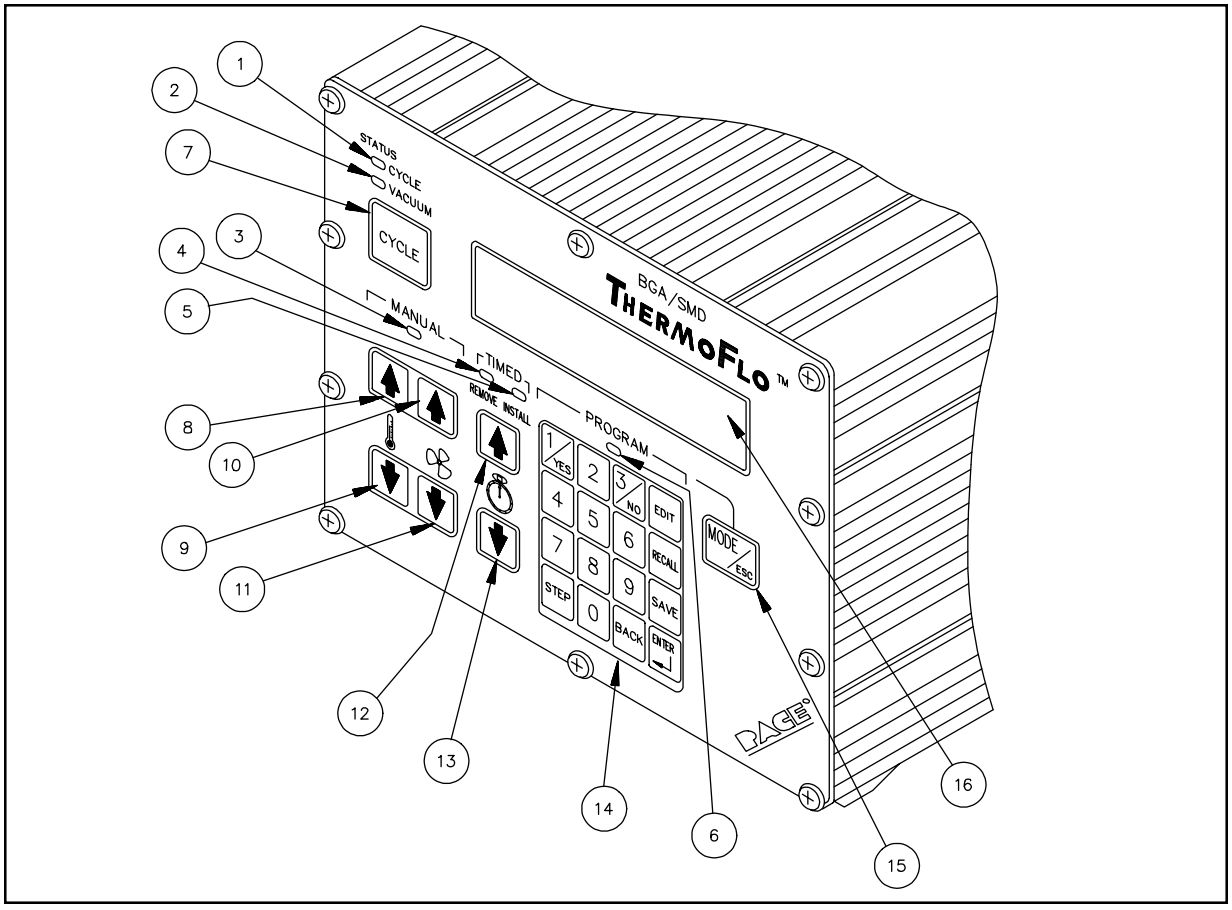


Figure 1.

REAR PANEL

17. **POWER SWITCH** - Turns system ON and OFF; controls input power to the system.
18. **POWER FUSE/FUSEHOLDER** -Provides overload protection for the ThermoFlo unit.
19. **AC POWER RECEPTACLE** - Provides AC power to the system from the outlet through power cord.
20. **EARTH GROUND RECEPTACLE** - Provides positive earth ground to which a ground cable can be connected from the workpiece or work surface as part of a static control program.
21. **GFI LIGHT** - Illuminates Green in color when unit is powered on. Light goes off when a handpiece ground fault, heater fault or blower fault is detected and heater operation is disabled.
22. **HANDPIECE CABLE ENTRY** - Hard-wired cable entry from ThermoFlo handpiece to power source.
23. **HEAT WAVE CONNECTOR** - Provides connection to PACE HeatWave power source to activate optional preheat system (Heat Wave).
24. **COM PORT** - Future use communication port.

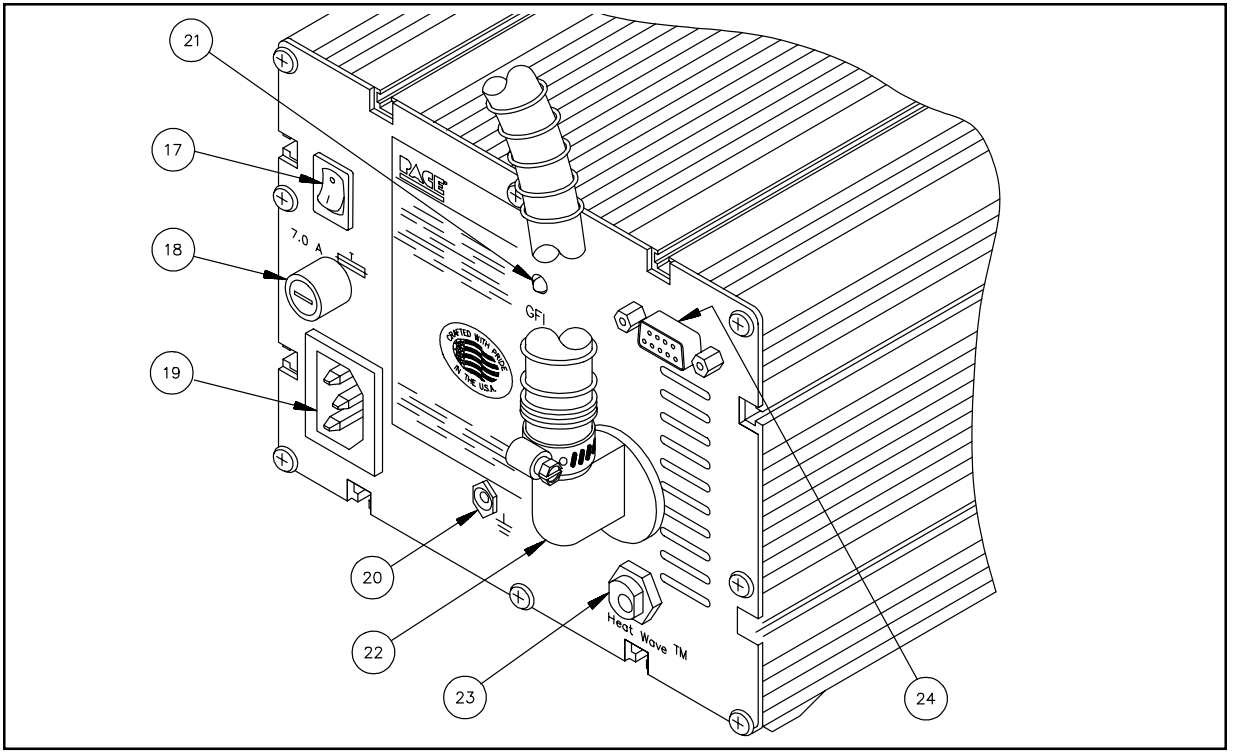


Figure 2.

THERMOFLO HANDPIECE

25. **VACUUM PICK SWITCH** - Activates & deactivates vacuum pump supply to the Vacuum Pick Assembly. Switch must be depressed for a period of 0.5 second before circuit deactivation; activation is immediate.

26. **CYCLE SWITCH** - Activates reflow cycle (heat & air flow). Switch must be held to maintain activation in Manual Mode; in Timed & Program Modes, switch is pressed & released to initiate set cycle time. Switch can be used to abort cycle in Timed or Program Mode operation.

27. **VACUUM PICK ADJUST CONTROL** - Provides adjustment for height of Vacuum Pick Assembly (& Vacuum Cup). Turn clockwise to raise pick or counterclockwise to lower pick.

28. **VACUUM PICK ASSEMBLY** - Provides a means to lift or place components.

29. **HEAT SHIELD**-Protects the operator from unintentional contact with the heater.

30. **VACUUM CUP** - Provides positive holding of components for positioning during the replacement process and for lifting of the component during the removal process.

31. **NOZZLE ASSEMBLY** - Directs heated air from the heater assembly to the solder joint areas for soldering or desoldering of components. Nozzles are optional parts ordered for a specific application.

32. **QUICKFIT NOZZLE ADAPTER** - Allows quick nozzle attachmentand release.

OPTIONAL ACCESSORIES

33. **OPTIONAL ACCESSORIES** - Optional accessories such as a Work Platform, preheating system, lighting and vision attachments fume extraction and board holders are available. Accessories are described in "Systems & Accessories" located in the Replacement Parts section of this manual.

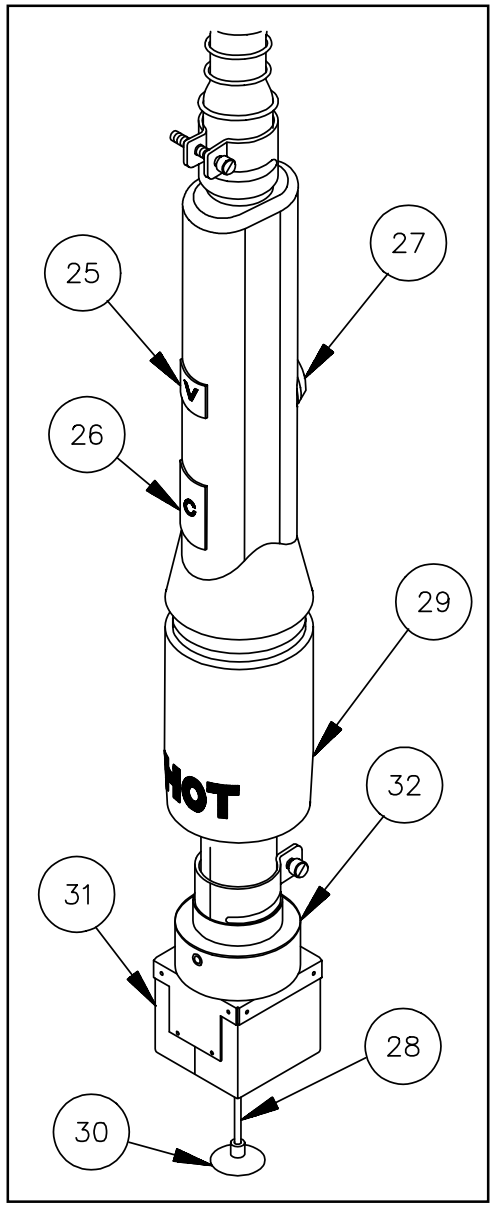


Figure 3.

Safety

The purpose of this "SAFETY" section is to inform users of the heading guidelines used in this manual to indicate special Notes, Cautions, Warnings or Dangers. Also included are precautions which must be observed when operating or servicing this product.

Heading Guidelines

PACE adheres to the following Heading Guidelines (based on OSHA guidelines) when listing special information or precautions to be taken. Especially important are all procedures and practices which, if not strictly observed, could result in injury or loss of life.

These "NOTES", "CAUTIONS","WARNINGS" and "DANGERS" are inserted in this manual whenever deemed necessary. They will appear as shown below.

NOTE
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

NOTE

Used to indicate a statement of company recommendation or policy. The message may relate directly or indirectly to the safety of personnel or protection of property. NOTE is not associated directly with a hazard or hazardous situation and is not used in place of "CAUTION", "WARNING" or "DANGER".

CAUTION

Used to indicate a hazardous situation which may result in minor or moderate injury. May also be used to alert personnel to conditions, procedures and practices which, if not observed, could result in damage to or destruction of the product or other equipment.

WARNING

Used to define additional information that if not closely followed might result in serious damage to equipment and represent a potential for serious personnel injury.

DANGER

Defines additional information that if not closely followed might result in severe personnel injury or death. Danger is not used for property damage unless personal injury risk is present.

Precautions

The following are general safety precautions which personnel must understand and follow when using or servicing this product. These precautions may or may not be included elsewhere in this manual.

Usage Warnings/Cautions

WARNINGS

1. A fire may arise if the ThermoFlo is not used with care.

2. Do not use the ThermoFlo in the presence of an explosive atmosphere.

3. Be careful when using the ThermoFlo in places where there are combustible materials. Heat may be conducted to combustible materials which are out of sight.

4. Do not apply heat from the ThermoFlo to one place for a long time. Be sure to place the handpiece on the standafter use and allow to cool before storage.

5. Do not leave the ThermoFlo unattended while powered on.

CAUTIONS

1. The ThermoFlo handpiece heater assembly housing and any installed nozzle are hot when the system is being cycled and for a period of time thereafter. DO NOT touch either the heater assembly housing, nozzle or direct heated air stream. Severe burns may result!
2. Always use the handpiece with the Heat Shield installed except when the handpiece is mounted to its work platform. The Heat Shield helps to prevent unintentional contact with the heater.
3. Utilize all standard electrical safety precautions when using this or any other electrical equipment.
4. Always use this system in a well-ventilated area. A fume extraction system such as those available from PACE are highly recommended to protect personnel from solder flux fumes.
5. Exercise proper precautions when using chemicals (e.g., solder paste). Refer to the Material Safety Data Sheet (MSDS) supplied with each chemical and adhere to all safety precautions recommended by the manufacturer.

Servicing Precautions

DANGERS

POTENTIAL SHOCK HAZARD - Repair procedures performed on this product should be performed by qualified service personnel only. Line voltage parts will be exposed when equipment is disassembled. Service personnel must avoid contact with these parts when troubleshooting.

NOTES

To ensure continued peak performance, use genuine PACE replacement parts.

Electrical Requirements

The ThermoFlo unit draws 700 Watts, which is listed on the nameplate on the power source rear panel. A separate, dedicated AC supply line circuit may be required to adequately power the unit/system. If your power outlet cannot provide suitable power, arrange for a qualified, licensed electrician to install one for you.

System Set-up

Set up the ThermoFlo unit using the following steps and associated drawings.

1. Remove the ThermoFlo from its shipping container(s). Store the shipping container(s) in a convenient location. Reuse of these containers will prevent damage if you ship or store the system.

2. Set the ThermoFlo unit on a convenient work bench.

3. Place the **POWER** Switch (on power source rear panel) in the "OFF" or "0" position.

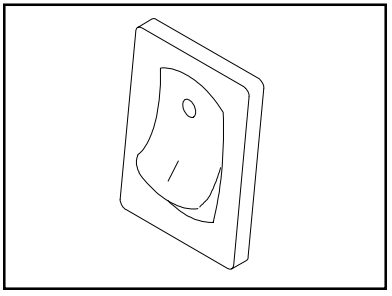


Figure 4.

4. Inspect all system components to check for shipping damage and to ensure that all purchased components (standard and options) are present. Use the drawings provided in the following pages as a guide for checking the parts that come with the unit. For purchased options, use the ThermoFlo Accessory Manual (P/N 5050-0421) supplied with them.

ANGLE BRACKET KIT

The Angle Bracket Kit elevates the front of the power source to allow easier viewing and access to the front panel controls. Attach the kit to the ThermoFlo power source using the following instructions.

1. Turn the power source upside down on the work bench with the front panel facing away from you.

2. Loosen the 2 Thumb Nuts shown in the illustration and slide toward the rear of the power source.

NOTE

The ThermoFlo Unit is shipped with the 2 Thumb Nuts and Mounting Screws attached to the bottom of the power source case. Power sources other than the ThermoFlo will require installation of the 2 Thumb Nuts and 2 Mounting Screws onto the power source case.

3. Position Angle Bracket to the front of the power source and just behind the two (2) rubber feet on the power source case.

4. Slide the 2 mounting slots in the Angle Bracket beneath the 2 Thumb Screws. You may need to adjust the Thumb Nuts to provide enough space between the Thumb Nuts and the power source case.

5. Tighten Thumb Nuts to secure bracket in position.

6. Remove the paper backing from the two (2) rubber feet and place in position on the Angle Bracket as shown in the illustration.

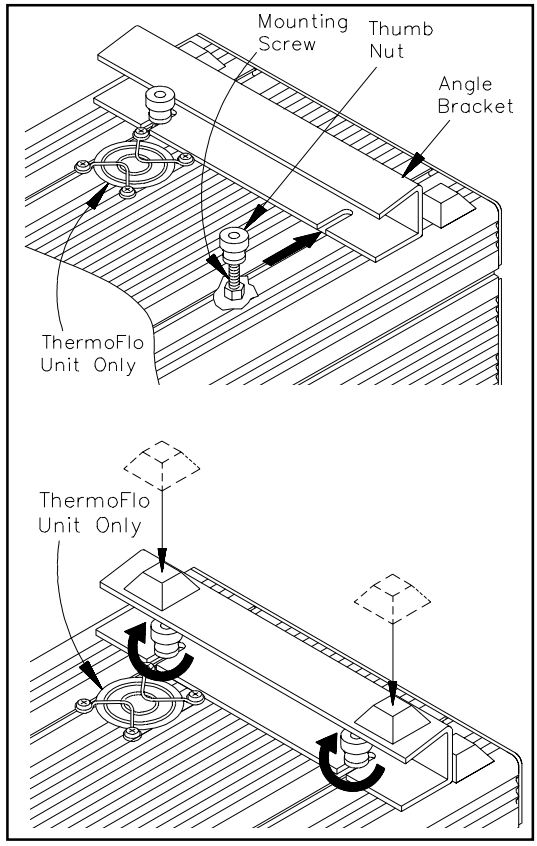


Figure 5.

THERMOFLO CUBBY KIT

The ThermoFlo Cubby Kit can be attached to either side of the power source.

To attach the ThermoFlo Cubby Kit (handpiece holder) to the power source, use the following instructions.

1. Position the Holder as shown with the curved wire ends directly beneath the mounting holes in the Cubby Bracket. Secure the Holder to the bracket using the two (2) Holder Mounting Screws, Washers and Locknuts.
2. From the rear of the power source, insert the 2 enclosed Bracket Mounting Screws (head first) into top "T" Slot on the side of the power source case. Pull the screws toward the front of the power source.
3. Place the Cubby onto the side of the power source, inserting the two (2) Mounting Screws through any two (2) opposing Mounting Holes in the Cubby Bracket. The multiple mounting holes allow the user to adjust the Cubby as desired.
4. Install a Thumb Nut onto the end of each Mounting Screw.
5. Adjust Cubby Bracket flush with front of power source. Tighten Thumb Nuts to secure bracket in position.

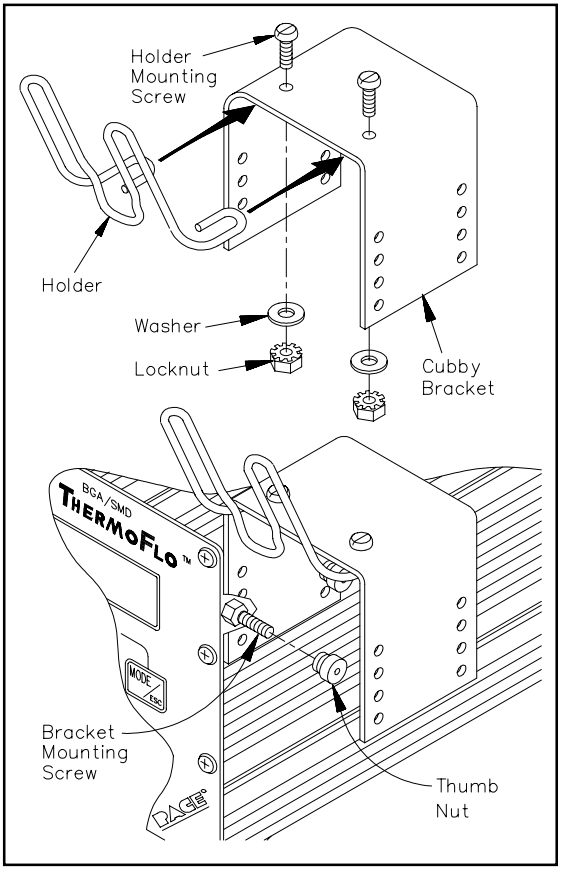


Figure 6.

HOSE RETENTION KIT

The ThermoFlo Hose Retention Kit can be attached to either side of the power source. Attach the Hose Retention Kit to the power source using the following instructions.

1. Attach the Slide Tube to the Retention Bracket as shown using the Tube Mounting Screw and Lockwasher. Position tube with Tube Access Hole facing in direction shown. Tighten the Tube Mounting Screw to secure in position.

2. From the rear of the power source, insert the 2 enclosed Mounting Screws (head first) into the bottom "T" Slot on the side of the power source case.
3. Place the Bracket onto the side of the power source, inserting the two (2) Mounting Screws through the two (2) Mounting Holes in the bracket.
4. Install a Thumb Nut onto end of each Mounting Screw.
5. Adjust Bracket flush with rear of power source. Tighten Thumb Nuts to secure bracket in position.
6. Position Locking Collar over end of Slide Tube with beveled end of collar facing up and with Collar Access Hole in line with Tube Access Hole.
7. Insert end of Slide Rod through top of Locking Collar and into the Slide Tube. Slide rod fully into the tube.
8. Install the Locking Screw into the Locking Collar. Ensure that the collar is positioned properly on the tube; see step #6. Tighten the Locking Screw and check the Slide Rod; it should now be secured in position by the Locking Screw.
9. Check to ensure the the Slide Rod can be moved up and down when the Locking Screw is loosened and secured in position when the screw is tightened.
10. Place the ThermoFlo handpiece air hose in position as shown in the loop at the end of the Slide Rod and with the handpiece in the cubby (or installed on the Work Platform). The hose and Slide Rod can be easily adjusted for optimum use.

NOTE

The Air Hose and Slide Rod must be positioned to prevent any kinking of the Hose. Kinks in the Hose will prevent proper air flow when the system is operated and will cause a deterioration in performance.

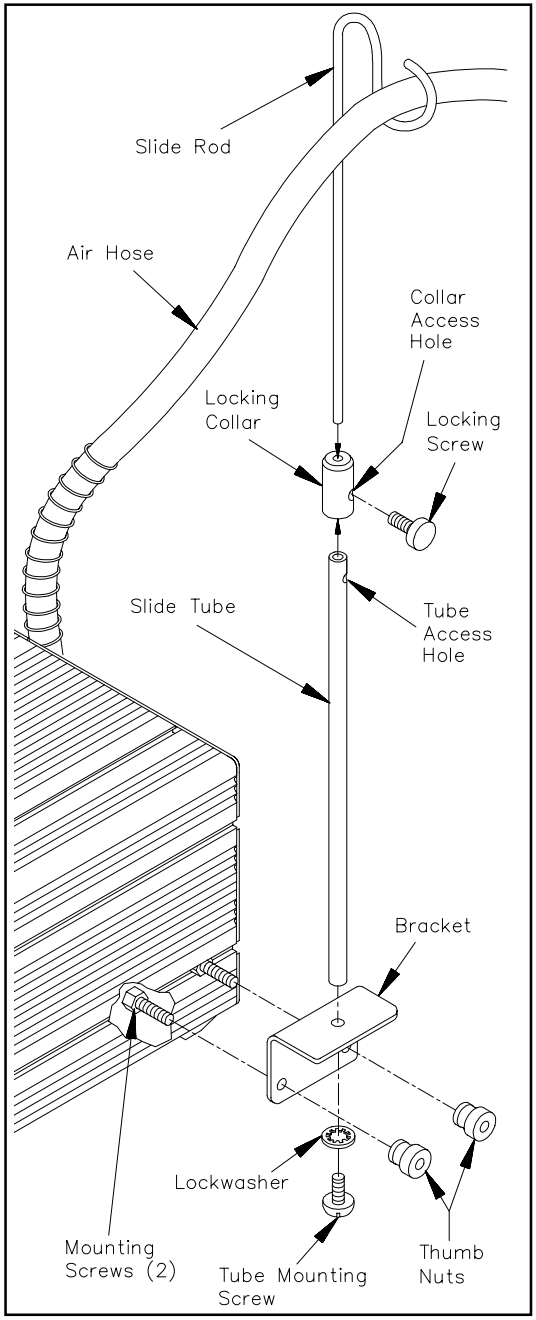


Figure 7.

QUICKFIT NOZZLE ADAPTER

The ThermoFlo QuickFit Adapter allows you to easily change out any PACE ThermoFlo Nozzle. Attach the adapter to the handpiece heater using the following instructions.

1. Insert the QuickFit Adapter into the end of the handpiece heater as shown.

2. Position the QuickFit Adapter so the Line on the heater is aligned with one of the 3 lines (1 long & 2 short lines) on the Locking Collar. Tighten Collar Locking Screw to secure adapter in position.

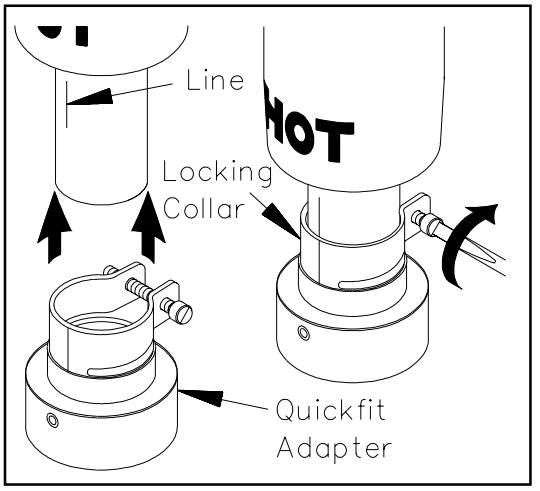


Figure 8.

OPTIONAL ACCESSORIES

Install all purchased options (e.g., work platform, lights, camera system) at this time. A separate installation/ instruction manual (PACE part number 5050-0421) is enclosed with these options.

POWER UP

1. Insert the power cord into the AC Power Receptacle located on the rear panel of the power source.

CAUTION
To insure operator safety, the AC supply receptacle must be checked for proper grounding before initial system operation.

2. Plug the power cord into the AC supply receptacle.

3. Turn the Power Switch to the "ON" ("I") position.

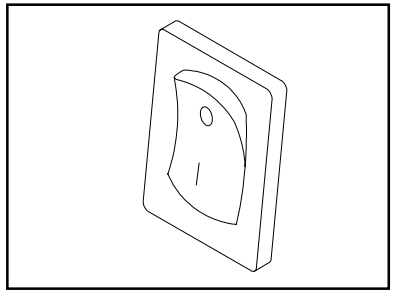


Figure 9.

4. Test the system for proper operation. Refer to the "Quick Start" portion of this manual.

Introduction

The PACE ThermoFlo unit is easy to operate and can be quickly set up for use in Manual and Timed modes of operation. The following Manual and Timed Modes of Operation sections provide **basic** guidelines for rework using the PACE ThermoFlo.

For complete instructions detailing these operations, read the Operation and Set-Up Mode sections of this manual.

Manual Mode of Operation

REMOVAL

1. Install proper Nozzle onto ThermoFlo Handpiece.
2. Turn Power Switch ON. Press **MODE/ESC** Key until Manual Mode Light illuminates.
3. Adjust Set Temperature and Blower Speed as desired using Scroll Keys. See Figure 10-1.
4. Lower Nozzle over component (slightly above component leads) to direct air flow to solder joints. See Figure 10-2.
5. Press and hold handpiece Cycle Switch to initiate reflow cycle.
6. When complete reflow of solder joints is observed, lift component from PCB using PACE HandiPik or tweezers.

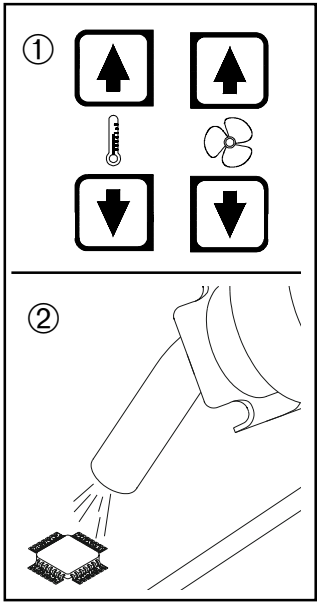


Figure 10.

INSTALLATION

1. Install proper Nozzle into ThermoFlo Handpiece.

2. Turn Power Switch ON. Press **MODE/ESC** Key until Manual Mode Light illuminates.

3. Adjust Set Temperature and Blower Speed as desired using Scroll Keys. See Figure 11-1.

4. Position replacement component on prepared land pattern. See Figure 11-2.

5. Lower Nozzle to direct air flow to solder joints.

6. Press and hold handpiece Cycle Switch to initiate reflow cycle. See Figure 11-3.

7. When complete reflow of solder joints is observed, release handpiece Cycle Switch and lift handpiece.

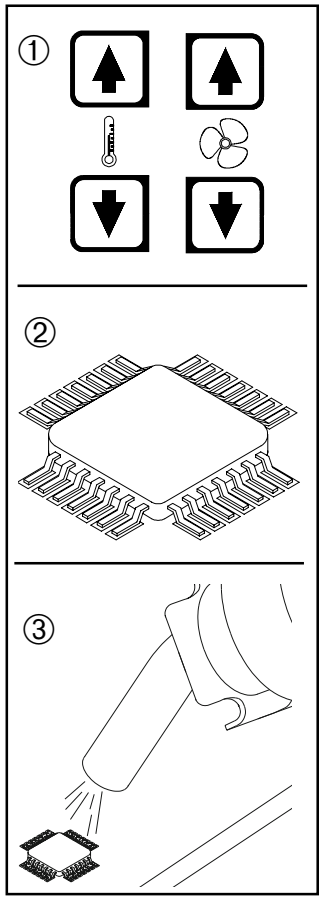


Figure 11.

Timed Mode Of Operation

REMOVAL

NOTE
The ThermoFlo System Work Platform (PACE part number 6018-0099) is optionally available to assist in the installation/removal process.

1. Install proper Nozzle & Vacuum Cup (if required) into ThermoFlo Handpiece.

2. Turn Power Switch ON. Press **MODE/ESC** Key until Timed Remove Mode Light illuminates.

3. Adjust Set Temperature, Blower Speed and Cycle Time as desired using Scroll Keys. See Figure 12-1.

4. If using Vacuum Cup, adjust the cup (using the Vacuum Pick Adjust Control) to a point where the bottom of the cup is flush with the bottom edge of the nozzle. See Figure 12-2.

5. Lower Nozzle over component (slightly above component leads) to direct air flow to solder joints. Ensure contact between the vacuum cup and the component.

6. Press and release handpiece Cycle Switch to initiate reflow cycle. See Figure 12-3.

NOTE
Five seconds prior to cycle completion, vacuum will activate automatically.

7. When cycle is complete, lift handpiece.

8. Place handpiece over heat resistant surface. Press and hold Vacuum Switch for 1/2 second to turn vacuum off and release component.

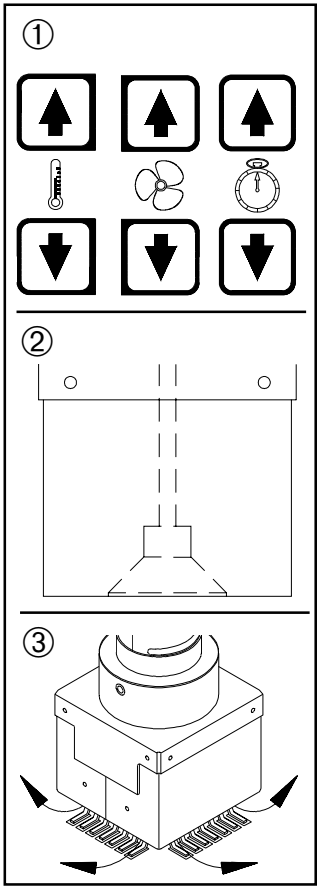


Figure 12.

INSTALLATION

NOTE
The ThermoFlo System Work Platform (PACE part number 6018-0099) is optionally available to assist in the installation/removal process.

1. Install proper Nozzle & Vacuum Cup (if required) into ThermoFlo Handpiece.
2. Turn Power Switch ON. Press **MODE/ESC** Key until Timed Install Mode Light illuminates.
3. Adjust Set Temperature, Blower Speed and Cycle Time as desired using Scroll Keys. See Figure 13-1.
4. When using a single jet Nozzle, place component by hand and proceed to step 7.
5. Position replacement component directly beneath & square to nozzle.
6. Lower Vacuum Cup to contact component. Press Vacuum Switch to activate vacuum and grasp component. Adjust height of component to nozzle. See Figure 13-2.
7. Lower Nozzle to direct air flow to solder joints. If component is held by vacuum, hold component to a point where its leads/contacts rest gently on or just above the land pattern. See Figure 13-3.
8. Press and release handpiece Cycle Switch to initiate reflow cycle. See Figure 13-3**.**

NOTE
Five seconds prior to cycle completion, vacuum will activate automatically.

9. When cycle is complete, lift handpiece.

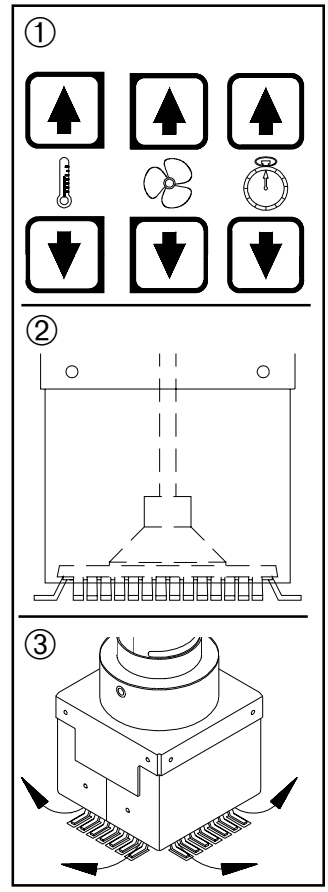


Figure 13.

Program Mode Of Operation

The following is a simple, basic flow chart of the Program Mode of Operation. Use this as a quick reference when using a rework profile previously stored in unit memory.

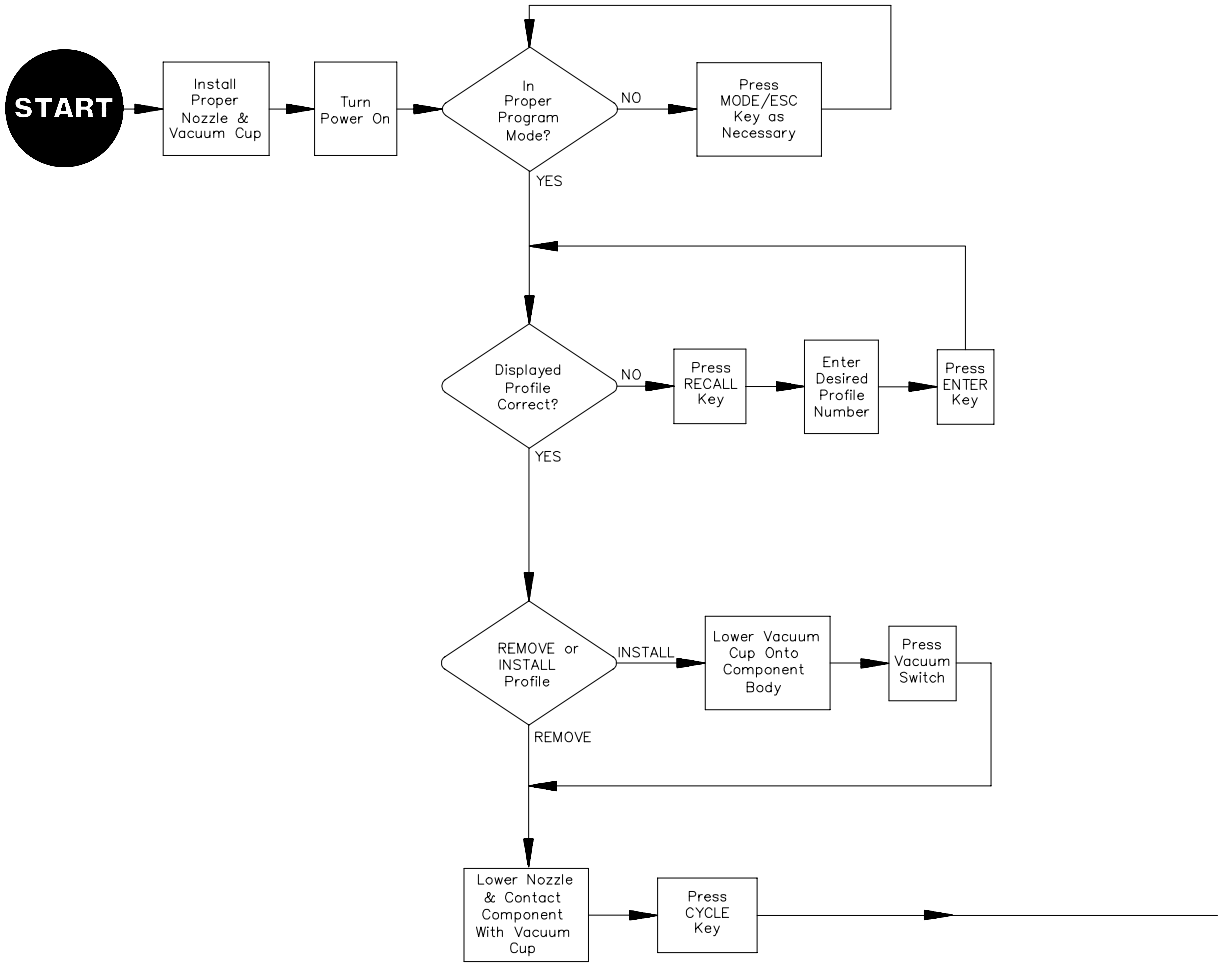
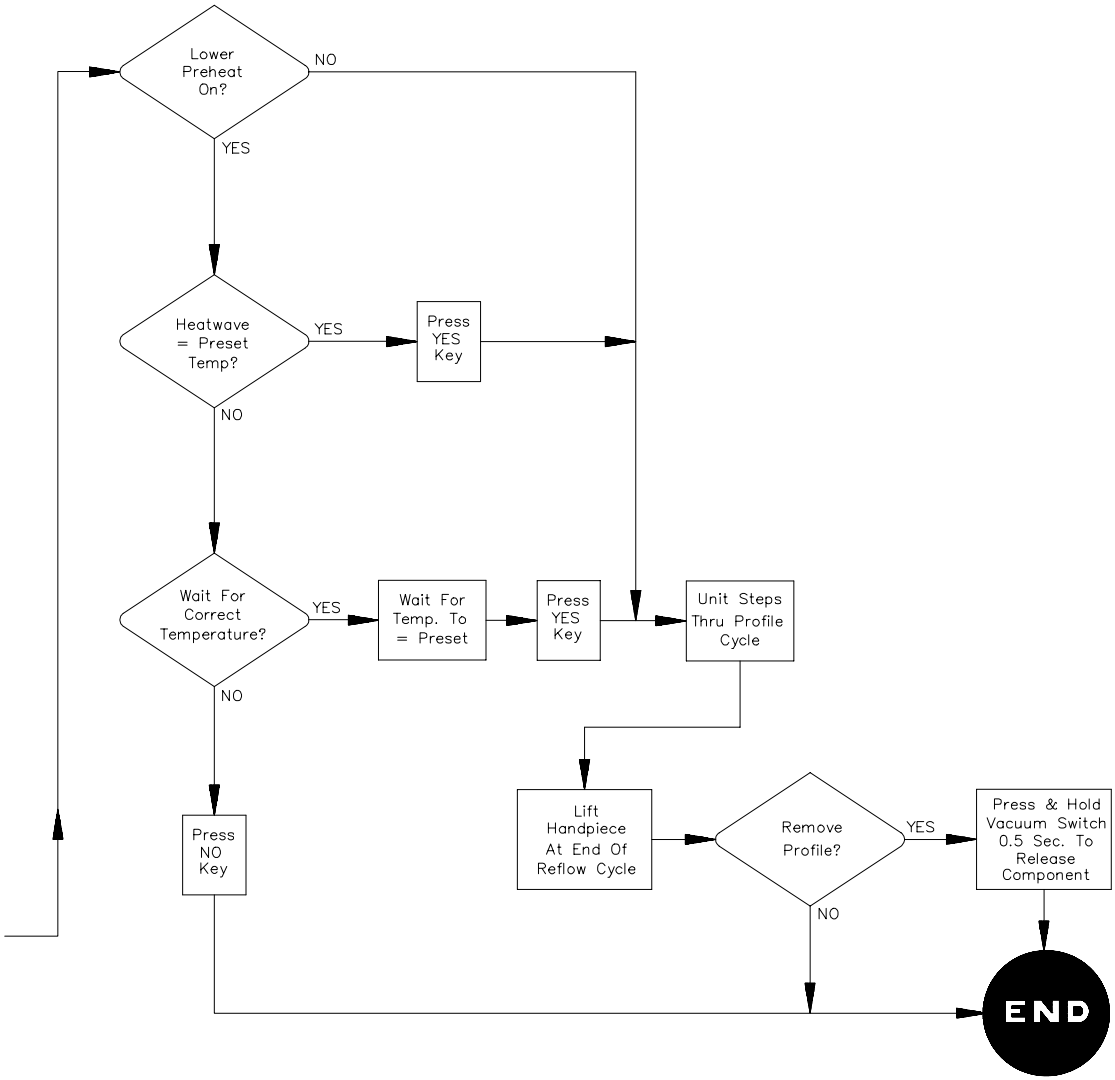


Figure 14.


Lower Preheat On?
NO
YES
Heatwave = Preset Temp?
YES
Press YES Key
NO
Wait For Correct Temperature?
YES
Wait For Temp. To = Preset
Press YES Key
Unit Steps Thru Profile Cycle
NO
Press NO Key
Lift Handpiece At End Of Reflow Cycle
Remove Profile?
YES
Press & Hold Vacuum Switch 0.5 Sec. To Release Component
NO
END

Introduction

The ThermoFlo Unit provides the user with the ability to perform non-destructive, repeatable, high quality, component installation or removal operations. The operator can adjust the parameters of air temperature, air flow rate (blower speed), cycle time, nozzle configuration and pre/auxiliary heating to suit the heating characteristics of the particular component and substrate. Once you have established the desired profile, the process parameter details can then be entered on the Profile Control Chart for future reference and programmed into the ThermoFlo Unit memory. The Profile Log can be used for summarizing required parameters for profiles in Manual, Timed or Program Modes. Once the Profile is entered into memory, the program can be quickly initiated (in Program Mode). Up to 80 user-defined profiles may be stored in microprocessor memory.

NOTE
When developing Profiles, PACE recommends the use of embedded thermocouples on a test board to ensure optimum process results.

Profile Development

1. The Profile Control Chart details the complete parameters for a developed profile. The Profile Log is a quick reference log sheet detailing basic profile information (including stored profile number) on a number of Profiles.

2. Develop the rework profile which adheres to your company guidelines and provides optimum results.

3. Enter the established Profile parameters on the Profile Control Chart.

4. Enter the Profile in system memory (see "Program Mode" in the Operation section of this manual for details).

5. Enter the Profile information on the Profile Log..

THERMOFLO REFLOW PROFILES
SUGGESTED STARTING PARAMETERS

This chart provides a base starting point for the development of exact parameters ("Established Profile Guidelines") for your surface mount rework process. Initial tests using these references may not result in complete solder reflow. Adjust the reference values as necessary to obtain desired results.

Procedure:

1. Select the Component and Substrate which best matches your application.
2. Perform a test using the base parameters.
3. Adjust parameters as desired and perform aditional test runs.
4. When desired results are achieved, record process on a copy of Profile Control Chart or Profile Log.

NOTE: Blower Speed parameter is base reference for Reflow function.

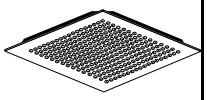
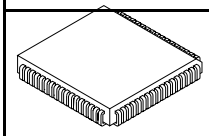
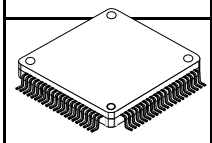
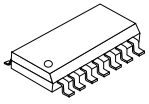
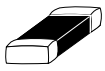
Component		Nozzle	Process	Parameter	Substrate (PCB Type)			Reflow Cycle
Outline	Type	Recommended Type	Remove or Install	(Temperature and Blower Speed)	Low Mass	Medium Mass	High Mass	Time (sec.)
	PBGA	Appropriate Size V-A-N Nozzle	Remove	Temperature (°C)	371	371	371	77
				Blower Speed	5	5	5	
			Install	Temperature (°C)	371	371	371	90
				Blower Speed	3	3	4	
	PLCC (J Lead)	Appropriate Size Box Nozzle	Remove	Temperature (°C)	371	371	371	30
				Blower Speed	7	8	8	
			Install	Temperature (°C)	371	371	371	30
				Blower Speed	7	8	8	
	PQFP	Appropriate Size Box Nozzle	Remove	Temperature (°C)	316	371	371	18
				Blower Speed	6	7	7	
			Install	Temperature (°C)	316	371	371	18
				Blower Speed	6	7	7	
	SOIC	Appropriate Size Pattern Nozzle	Remove	Temperature (°C)	316	316	371	15
				Blower Speed	7	7	7	
			Install	Temperature	316	316	371	15
				Blower Speed	7	7	7	
	Chip Component	Appropriate Size Single Jet Nozzle	Remove	Temperature	371	371	371	11
				Blower Speed	6	6	8	
			Install	Temperature	371	371	371	12
				Blower Speed	5	6	7	

Figure 15.

Profile Control Chart

Duplicate this page and complete the copied form. **DO NOT** fill out the copy in this manual.

PROGRAM MODE PROFILE CONTROL CHART **Profile #**

Compone _____ **Temp. Scale:** F C **Process:** Remov Install

PCB Designation: _____

Preheat		Yes	No	**Top Preheat**	Yes	No
Lower	**Preheat**	Yes	No	Time		
	Time			Temp.		
	Temp.			Start		(sec.)
				Blower Speed		
Soak		Yes	No	Temp.		
	Time		(sec.)	Blower Speed		
Reflow		Yes	No	Temp.		
	Time			Blower Speed		
(Install Only)	Vacuum Release			Lower Pump	On	Off
Cool Down		On	Off	**Approved By:**		
	Time		(sec.)			
	Blower Speed			**Date:**		

Comments / Instructions:

Figure 16.

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PROFILE LOG

Duplicate this page and complete the copied form. **DO NOT** fill out the copy in this manual.

PCB Designation	Component	Process (Remove or Install)	Mode	Profile #	Set Temperature	Blower Speed	Cycle Time (sec.)	Preh Requi

Figure 17.

Board Preparation

Prepare the land pattern as per your company specifications. The most widely used methods are as follows:

1. Prefill - The PCB land pattern is prefilled using a soldering iron. Care must be taken to insure that all lands are tinned with an equal deposition of solder (provides a uniform appearance).
2. Solder Paste - Apply an equal amount of solder paste on each land using a solder paste dispenser to control deposition. Take care to insure that the proper amount of paste is dispensed. If too much paste is applied, solder bridges will form on the lands. If an insufficient amount of paste is applied, solder joint formation will be unacceptable (open/starved joints). The PCB assembly (or rework area) should also be preheated (in accordance with your company requirements) after solder paste deposition to remove any volatiles (e.g., solvents) in the paste. The PACE Heat Wave (HS-200) system is highly recommended for this preheating application.

Component Positioning

The ThermoFlo has the capability of placing many SMD components properly. In some instances (e.g., fine pitch FlatPack placement) however, the user may prefer to position a component and solder tack it in place prior to final soldering. The following procedure is extremely useful when installing leaded components.

1. Using a PACE HandiPik (vacuum holding device) or tweezers for handling or holding, position the component leads to align with the land areas.

NOTE
A flux paste may be applied to corners of the PCB land pattern to temporarily hold the component in place.

2. Using a soldering iron with a fine pointed tip, tack two or more lead to land locations at opposite corners of the component. This will provide stability during subsequent handling throughout the soldering process.

Preheating

Preheating of a printed circuit assembly is normally required in the repair process whenever any one or more of the following situations exist.

1. Epoxy glass substrate with 4 or more layers.
2. Substrate with large ground planes.
3. Substrate of ceramic, polyimide or other high heat dissipative material.
4. Printed circuit assembly with large metal heat sinks.

Preheating of assemblies such as those listed above will accomplish the following objectives.

1. Minimize thermal shock by elevating the assembly temperature to a level closer to solder melt temperature.
2. Minimize the heat cycle reflow time.
3. Overcome the heat dissipation characteristics of the assembly.
4. Minimize adjacent melts on densely populated assemblies.

The assembly undergoing repair must be heated for a length of time sufficient to saturate at the preheat temperature required. The PCB preheat temperature normally used is 100°C (212°F) for epoxy glass substrates and 120°C (248°F) for ceramics and polyimides.

Although many different methods such as ovens and preheated plates may be utilized to accomplish the required results, the user must employ a method which heats the assembly as evenly as possible and can be employed with the ThermoFlo unit. The preheat temperature should also be maintained throughout the Removal/ Replacement process. PACE recommends the use of its Heat Wave (HS 200) system for this purpose.

Definitions

Please read and become familiar with the definitions of each of the following terms which are used repeatedly in the following Operation, Set-Up Mode and Program Mode procedures.

Bottom Preheat - Application of preheat to the work from below using the PACE Heat Wave system. See "Preheat."

Cool Down - Application of unheated air (via the ThermoFlo handpiece) to cool the work from above at the conclusion of a rework cycle.

Edit Mode - Mode of program operation in which a profile can be altered (edited) and stored as changes to the original profile or stored as a new profile.

Lock Edit - Feature which prevents the changing (edit) of a stored profile without entry of the stored password.

Lock Keys - Feature which, when activated, prevents (locks out) use of any of the scroll keys in the Manual and Timed Modes and the STEP and RECALL Keys in the Program Mode without use of the stored password..

Lock Mode - Feature which prevents the changing of operating mode (Manual, Timed or Program) without entry of the stored password.

Manual Mode - Mode of operation in which the operator sets only Operating Temperature and Blower Speed parameters. The operator then manually performs a rework operation.

Operating Temperature - The true air stream temperature as it exits the handpiece heater assembly. This temperature is displayed on the Digital Readout during any given rework cycle where air is flowing through the handpiece.

Password - The password feature, when activated will prevent unauthorized alteration of stored system parameters. If a password has been installed, the Digital Readout will display an instruction to enter the password (a 4 key numerical sequence stored in Set-Up Mode) when a setting change is attempted.

Preheat - A preliminary process in which the work is heated at a predetermined rate from ambient to a desired elevated temperature in order to reduce the risk of thermal shock and to reduce cycle time during the Reflow (primary heating) process.

Profile - An established procedure for rework which includes all parameters (e.g., operating temperature, cycle time, preheat) required for optimum rework of a particular component/pcb combination. Any established Profile can then be utilized by entering it into system memory; the Profile can then be easily recalled and used in the system Program Mode.

Program Mode - Mode of operation in which a profile can be stored or altered (edited) or recalled and used to automatically sequence through the established procedure once the cycle is initiated.

Reflow Cycle - Application of heated air (via the ThermoFlo handpiece) to the work to obtain full reflow of all solder connections.

Set Temperature - The operator selected air stream temperature for the particular rework cycle.

Set-Up Mode - Mode of operation in which the operator can quickly and easily enter, change or delete system parameters (e.g., password, °C/°F display, profile deletion).

Soak - The application of heated air from the ThermoFlo handpiece to saturate the rework area after preheat (top and/or bottom) and prior to initiation of a Reflow Cycle in the Program Mode.

Timed Mode - Mode of operation in which the operator enters the Operating Temperature, Cycle Time, vacuum operation and Blower Speed parameters. When the reflow cycle is initiated, the system will operate as per those parameters and turn off at the end of the cycle time. The operator manually performs any other required procedures (e.g., vacuum operation, preheat) of the rework operation.

Top Preheat - Application of heated air (via the ThermoFlo handpiece) to preheat the work from above. See "Preheat."

Vacuum Release Time - Time delay from the start of a Reflow cycle (in Program Mode, Install only) until vacuum terminates to release component.

Nozzle Selection

Selection of the proper Nozzle is essential for achieving a quality component removal or installation. Each ThermoFlo Nozzle is designed to properly direct the heated air.

The Replacement Parts section of this manual lists standard nozzles and the components for which they are normally used. Custom nozzles are available upon request.

ThermoFlo Nozzles are available in 4 basic configurations.

① **V-A-N Nozzles** - Are used for removal/replacement of BGA components.

② **Box Nozzles** - Used for removal/replacement of surface mount components having solder connections on 4 sides of the component (e.g., QFPs & PLCCs).

③ **Pattern Nozzles** - Used for removal/replacement of surface mount components having solder connections on 2 sides of the component (e.g., SOICs).

④ **Single Jet Nozzles** - Available in straight, curved and flat end versions, these nozzles are used for removal/replacement of small surface mount components (e.g.,chip components), small QFPs, Land Grid Arrays (e.g., those used on pagers & cellular telephones) or for reflowing solder on single solder connections.

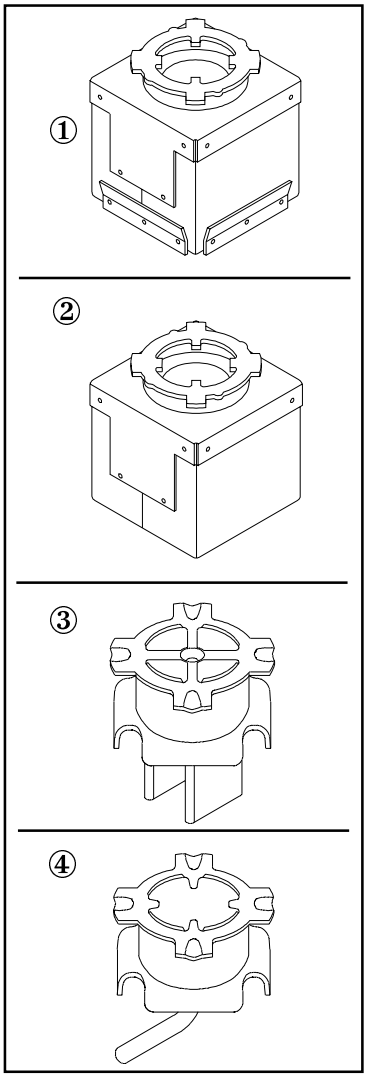

Figure 18.

Template Selection

Alignment Templates are used as an aid in aligning V-A-N Nozzles to the PCB Assembly when installing Ball Grid Arrays (BGAs). The I.D. (Inside Dimension) of the template should match the perimeter of the BGA land pattern.

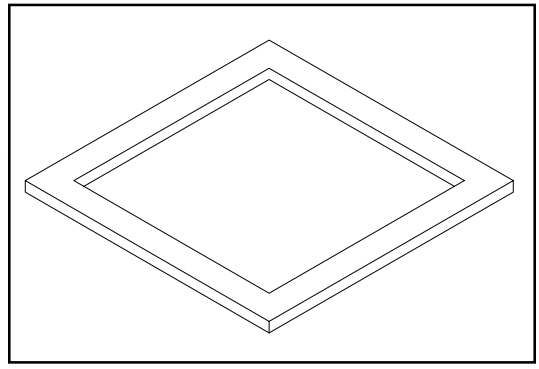

Figure 19.

Vacuum Cup Selection

Selection of the proper size vacuum cup is important for achieving an adequate holding force for each component. The cup selected should be as large as possible without exceeding the body size of the component. Vacuum cups are consumable items which deteriorate over a period of time. Refer to the Replacement Parts section of this manual when replacement is required.

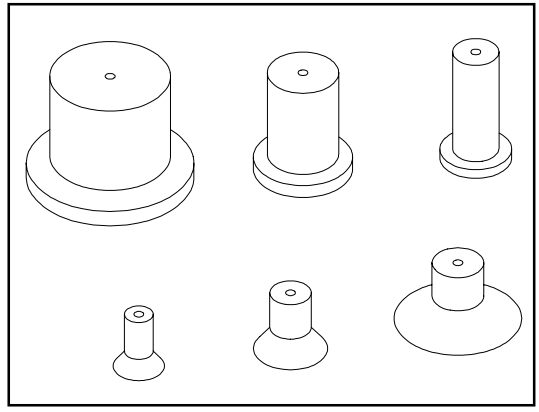

Figure 20.

Nozzle Changeout

REMOVAL

WARNING
Never remove a heated Nozzle using bare hands. Use the Rubber Pad. Never use a wrench or pliers when removing a Nozzle.

1. Holding the Rubber Pad, gently twist the nozzle as shown. The Nozzle will easily release from the Nozzle Adapter.

2. Place the Nozzle (still hot) on a heat resistant surface.

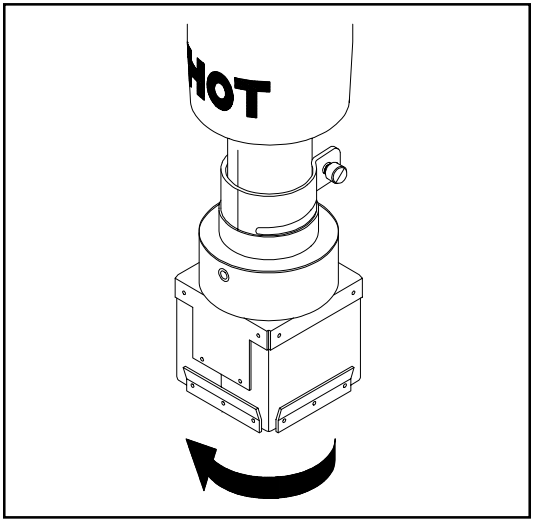

Figure 21.

INSTALLATION

1. Select the proper Nozzle for your application; see the “Replacement Parts” section of this manual.

2. Orient the Nozzle for best use on the component.

3. Insert the Nozzle up into the Nozzle Adapter (use Rubber Pad if nozzle is hot). Gently twist the nozzle as shown to lock nozzle in place.

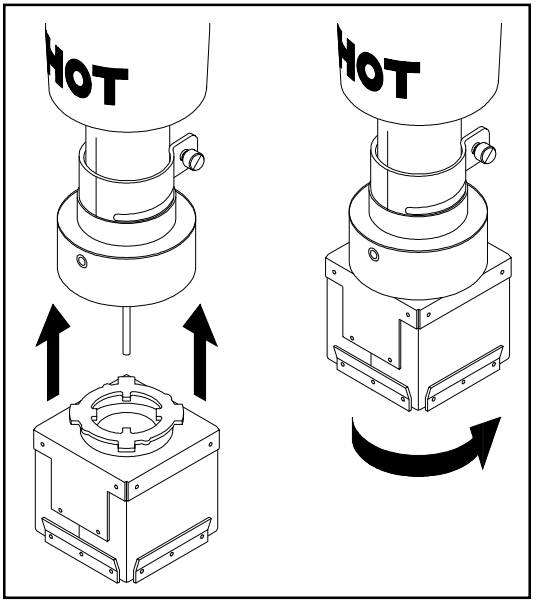

Figure 22.

Manual Mode of Operation

MANUAL MODE COMPONENT REMOVAL

1. Install the proper Nozzle Assembly and Vacuum Cup onto the handpiece. Ensure that the PCB assembly to be reworked and any replacement component have been properly prepared.

NOTE
Any required preheating operating should be completed before advancing beyond this point.

2. Set unit POWER Switch (on power source rear panel) to the ON position.

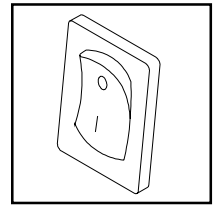

Figure 23.

3. Press and release **MODE/ESC** Key as necessary until the **MANUAL** Mode Light is illuminated.

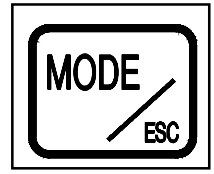

Figure 24.

4. Adjust the Set Temp as desired using the Temperature Scroll Up and Down keys. Press and hold the key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held.

5. Adjust the Blower Speed (1-9) as desired using the Blower Speed Scroll Up and Down keys.

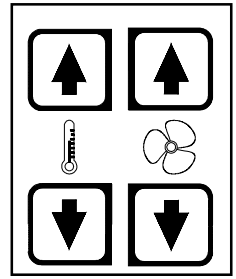

Figure 25.

MANUAL MODE COMPONENT REMOVAL (CONT'D)

6. If using a Single Jet Nozzle, no vacuum cup is used; proceed to step 11.

7. Using the Vacuum Pick Adjust Control, adjust the vacuum cup to a point where the bottom of the vacuum cup is flush with the bottom edge of the nozzle.

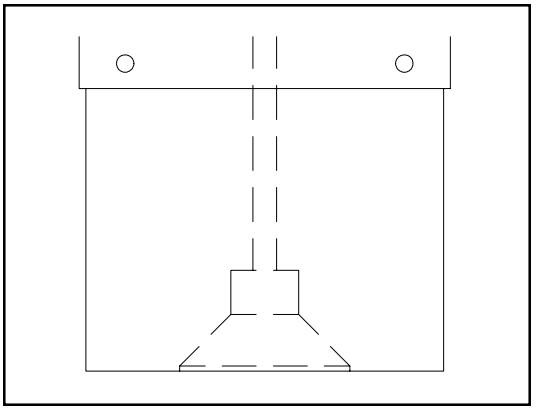

Figure 26.

8. Hold the handpiece vertical to the PCB.

9. Lower the nozzle:

   to a point 1mm (.040”) above the PCB when using a Box nozzle.

   to a point (depending on component) 1-1.5mm (.040-.060”) above the PCB when using a Pattern nozzle.

   to contact a BGA component when using a V-A-N nozzle.

10. Press and release handpiece Vacuum Pick Switch to activate vacuum.

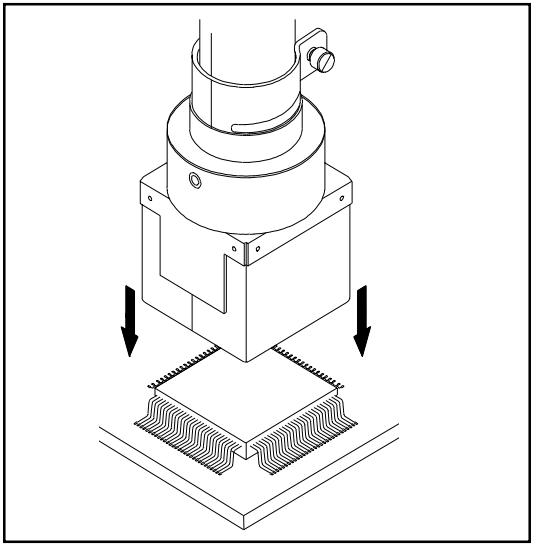

Figure 27.

MANUAL MODE COMPONENT REMOVAL (CONT'D)

11. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.

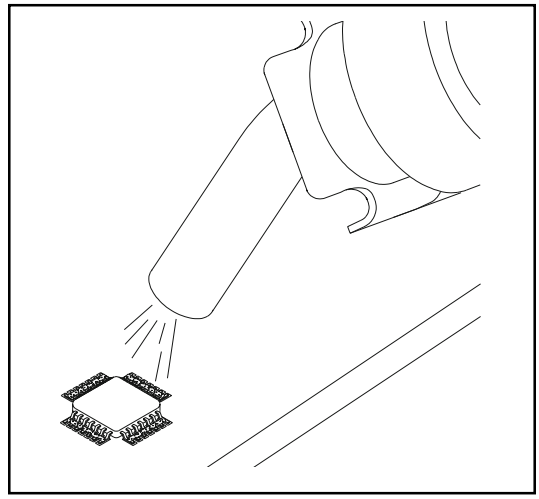

Figure 28.

12. Press and hold the handpiece Cycle Switch to activate heat cycle (the maximum cycle time is 999 seconds).

13. When complete solder melt is observed, gently lift the handpiece to remove the component from the PCB. When using a Curved, Single Jet nozzle, use a vacuum pickup device or tweezers to lift the component from the PCB; steps 14 & 15 are not used.

14. Position the nozzle (with component) over a heat resistant surface.

15. Press and hold the Vacuum Pick Switch for 0.5 second (minimum) to deactivate vacuum and release component.

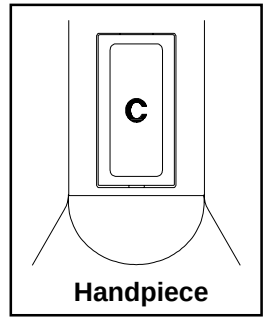

Figure 29.

WARNING
The component is HOT! DO NOT remove or catch the component with bare hands. Allow the component to drop onto the heat resistant surface. Allow sufficient time for the component and PCB to cool to room temperature before handling.

MANUAL MODE COMPONENT INSTALLATION

1. Install the proper Nozzle and Vacuum Cup (if not using Single Jet nozzle) onto the handpiece.

2. Set the unit POWER Switch (on rear panel of power source) to the ON position.

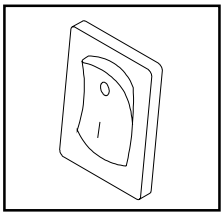

Figure 30.

3. Press and release **MODE/ESC** Key as necessary until the **MANUAL** Mode Light is illuminated.

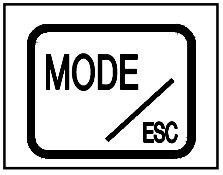

Figure 31.

4. Adjust the Set Temp as desired using the Temperature Scroll Up and Down keys. Press and hold the key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held.

5. Adjust the Blower Speed (1-9) as desired using the Blower Speed Scroll Up and Down keys.

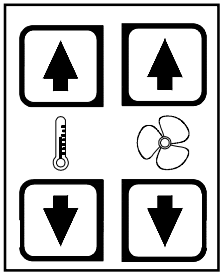

Figure 32.

MANUAL MODE COMPONENT INSTALLATION (CONT'D)

6. Press and release Vacuum Pick Switch to activate vacuum.

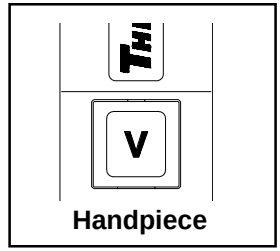

Figure 33.

NOTE
As an alternative to the component placement methods shown below in steps 7 through 10, the component (except BGAs) may be positioned and solder tacked in place on land pattern. See “Component Positioning”.

7. Position replacement component directly beneath and square to nozzle.

When using Box or V-A-N nozzles, insert component body into the bottom of the nozzle. BGA components will rest against the walls of the nozzle.

When using Pattern nozzles, position component leads beneath and in line with the air jets on the nozzle.

When using a Curved, Single Jet nozzle, position the component on its land pattern (prefilled or with solder paste deposition). Solder tack lead(s) if necessary.

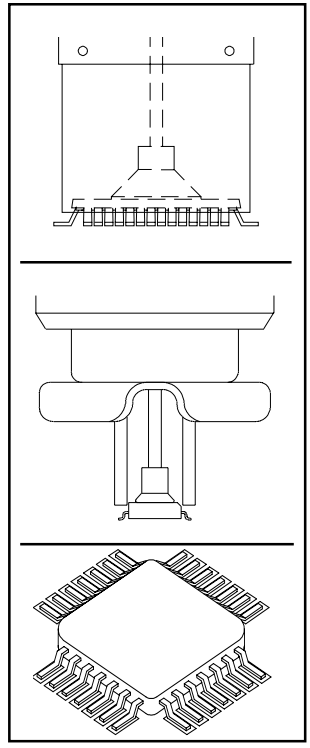

Figure 34.

MANUAL MODE COMPONENT INSTALLATION (CONT'D)

8. If using a Single Jet nozzle proceed to step 13.

9. Using the Vacuum Pick Adjust Control on the handpiece, adjust the vacuum cup to a point where the bottom of the vacuum cup touches the component body. The component is now held in position with the vacuum cup.

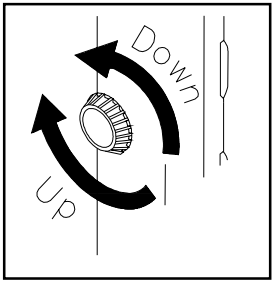

Figure 35.

10. Using the Vacuum Pick Adjust Control, adjust the position of the component

    to a spacing (depending on component) of 1-1.5mm (.040-.060") between the bottom of the component and the bottom of the nozzle when using a Box or Pattern nozzle.

    to contact a BGA component when using a V-A-N nozzle.

11. Lower nozzle (with component) to a point where the component leads/contacts rest gently on or just above the component land pattern.

NOTE
If component has been prepositioned on land pattern, lower nozzle to desired height above PCB. A height of 1-1.5mm (.040-.060") above the PCB when using Box or Pattern nozzles is recommended.

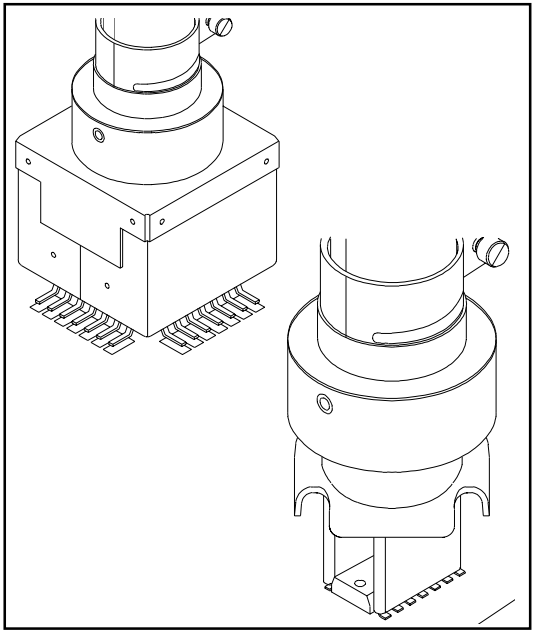

Figure 36.

12. Ensure that the handpiece is held vertical to the PCB (except with Single Jet nozzles).

13. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.

MANUAL MODE COMPONENT INSTALLATION (CONT'D)

NOTE
Any required preheating should be completed before advancing beyond this point.

14. Press and hold the handpiece Cycle Switch to activate heat cycle.

    Heated air is now being applied to the rework area.

15. If using a Single Jet nozzle in a hand held operation, move the handpiece as necessary to direct air flow to the solder areas requiring reflow.

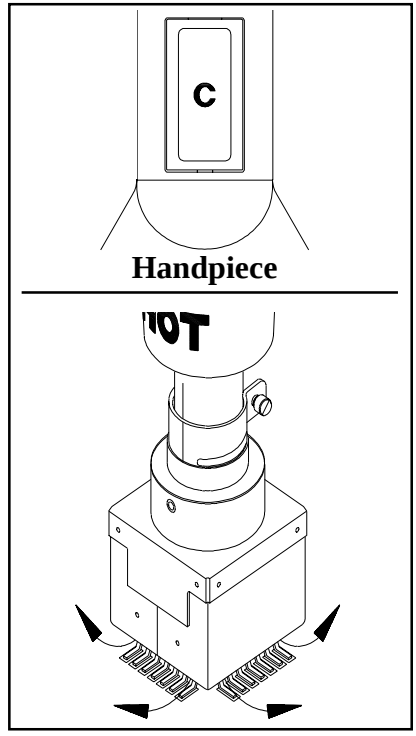

Figure 37.

16. If vacuum is being used to hold component, depress and hold the Vacuum Pick Switch for 0.5 second (minimum) to stop vacuum and release the component. Release the Vacuum Pick Switch.

17. When complete solder melt is observed, release the handpiece Cycle Switch (to cease air flow) and gently lift the handpiece from the PCB.

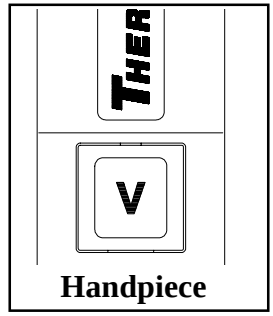

Figure 38.

Timed Mode of Operation

The Timed Mode offers added process control with the addition of a user-specified cycle time and automatic vacuum pickup/release.

TIMED MODE COMPONENT REMOVAL

NOTE
The ThermoFlo System Work Platform (PACE part number 6018-0099) is optionally available to assist in the installation/removal process.

1. Install the proper Nozzle and Vacuum Cup onto the handpiece.

2. Set the unit POWER Switch (on rear panel of power source) to the ON position.

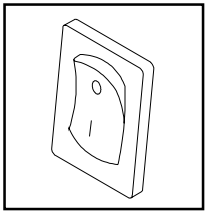

Figure 39.

3. Press and release **MODE/ESC** Key as necessary until the **TIMED** Mode **REMOVE** Light is illuminated.

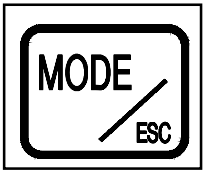

Figure 40.

TIMED MODE COMPONENT REMOVAL (CONT'D)

4. Adjust the Set Temp as desired using the Temperature Scroll Up and Down keys. Press and hold the key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held.

5. Adjust the Blower Speed (1-9) as desired using the Blower Speed Scroll Up and Down keys.

6. Adjust the Cycle Time as desired using the Cycle Time Scroll Up and Down keys. Press and hold the key; observe the Digital Readout as the Set Temperature increase (or decrease) in 1 second and then 10 second increments as the key is held.

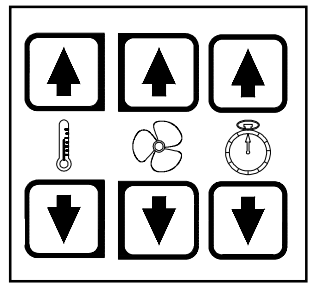

Figure 41.

NOTE
Any required preheating should be completed before advancing beyond this point.

7. If using a Single Jet nozzle, proceed to step 11.

8. Adjust the vacuum cup to a point where the bottom of the vacuum cup is approximately flush with the bottom edge of the nozzle using the Vacuum Pick Adjust Control.

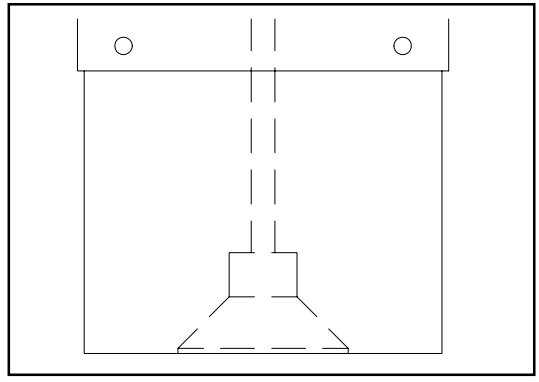

Figure 42.

9. Hold the handpiece vertical to the PCB.

TIMED MODE COMPONENT REMOVAL (CONT'D)

10. Lower the nozzle to a point 1mm (.040”) above the PCB when using Box or Pattern nozzles. Lower the nozzle to contact a BGA component.

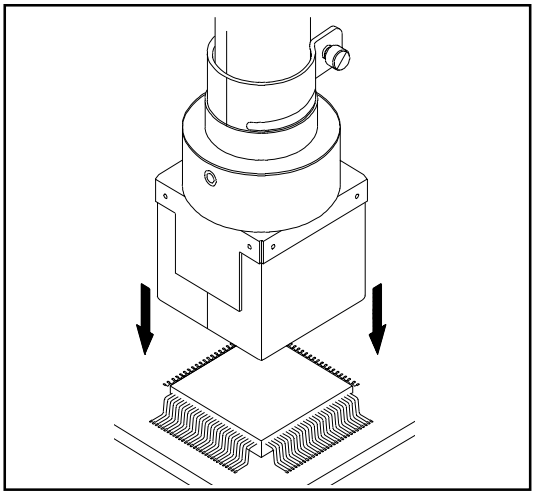

Figure 43.

11. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.

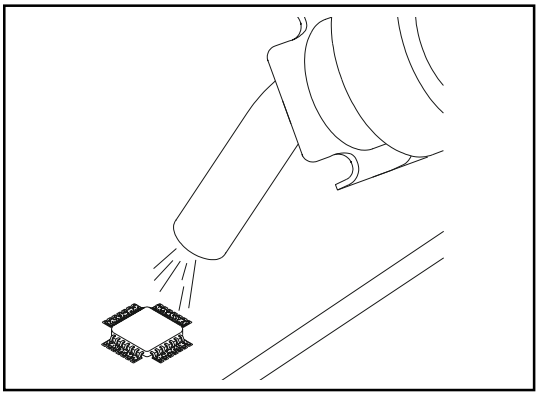

Figure 44.

12. Press and release the handpiece Cycle Switch or **CYCLE** Key on the power source to activate heat cycle.

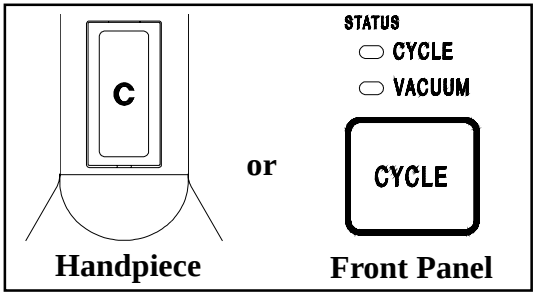

Figure 45.

TIMED MODE COMPONENT REMOVAL (CONT'D)

13. The Digital Readout will display the actual air temperature (as it exits the heater) and the remaining cycle ("Reflo") time counting down. At 5 seconds before the end of cycle, the vacuum will automatically activate.

14. At the end of the cycle, gently lift the handpiece to remove the component from the PCB. When using a Single Jet nozzle, use a vacuum pickup device or tweezers to lift the component from the PCB.

15. Position the component over a heat resistant surface.

16. Depress and hold the Vacuum Pick Switch for 0.5 second (minimum) to deactivate vacuum and release component.

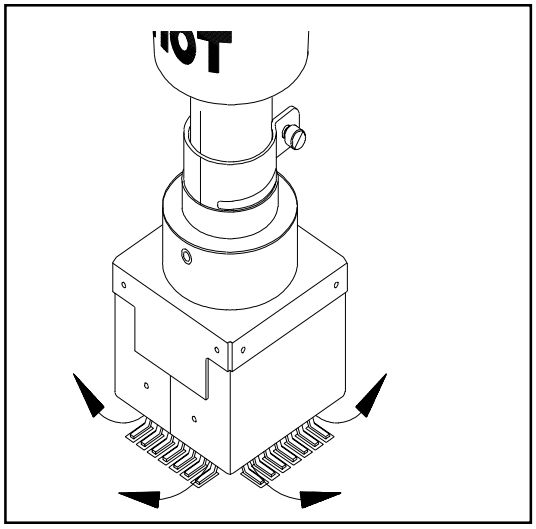

Figure 46.

WARNING
The component is HOT! DO NOT remove or catch the component with bare hands. Allow the component to drop onto the heat resistant surface. Allow sufficient time for the component and PCB to cool to room temperature before handling.

TIMED MODE COMPONENT INSTALLATION

NOTE
The ThermoFlo System Work Platform (PACE part number 6018-0099) is optionally available to assist in the installation/removal process.

1. Install the proper Nozzle Assembly and Vacuum Cup (if not using Single Jet nozzle) onto the handpiece.

2. Set the unit POWER Switch (on rear panel of power source) to the ON position.

3. Press and release **MODE/ESC** Key as necessary until the **TIMED** Mode **INSTALL** Light is illuminated.

4. Adjust the Set Temp as desired using the Temperature Scroll Up and Down keys. Press and hold the key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held.

5. Adjust the Blower Speed (1-9) as desired using the Blower Speed Scroll Up and Down keys.

6. Adjust the Cycle Time as desired using the Cycle Time Scroll Up and Down keys. Press and hold the key; observe the Digital Readout as the Set Temperature increase (or decrease) in 1 second and then 10 second increments as the key is held.

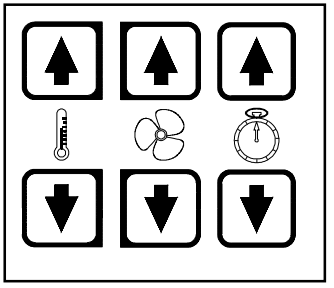

Figure 47.

TIMED MODE COMPONENT INSTALLATION (CONT'D)

7. If replacing a BGA component with the ThermoFlo handpiece mounted on a work platform, do the following:

   a) Place the Alignment Template over the land pattern.

   b) Align the template until the perimeter of the land pattern is centered inside of the template.

   c) Lower the handpiece (with nozzle) until it is slightly above the PCB assembly rework area.

   d) Adjust the PCB to center nozzle squarely over template.

   e) Raise handpiece from PCB.

   f) Remove Alignment Template.

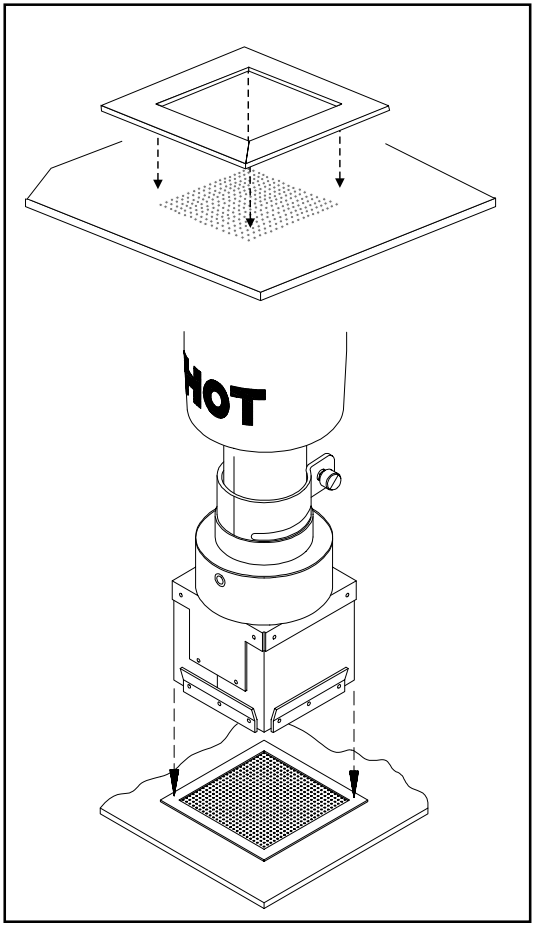

Figure 48.

TIMED MODE COMPONENT INSTALLATION (CONT'D)

NOTE
As an alternative to the placement methods shown below in steps 9 through 12, the component (except BGAs) may be positioned and solder tacked in place on land pattern. See “Component Positioning”.

8. Using the Vacuum Pick Adjust Control, adjust the vacuum cup to a point where the bottom of the cup is flush with the bottom edge of the nozzle.

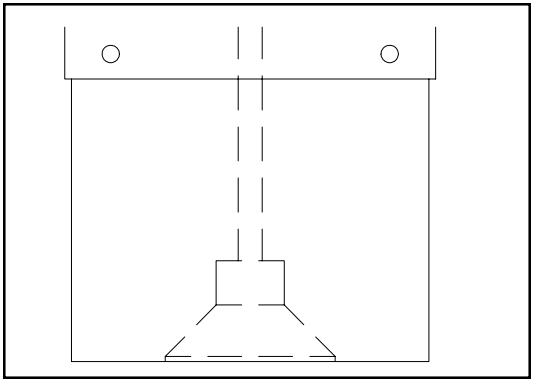

Figure 49.

9. Press and release Vacuum Pick Switch to activate vacuum.

10. Position the nozzle over the component with the component square to the nozzle.

    When using Box or V-A-N nozzles, insert component body into the bottom of the nozzle.

    When using Pattern nozzles, position component leads beneath and in line with the air jets on the nozzle.

    When using a Single Jet nozzle, position the component on its land pattern (prefilled or with solder paste deposition). Solder tack lead(s) if necessary.

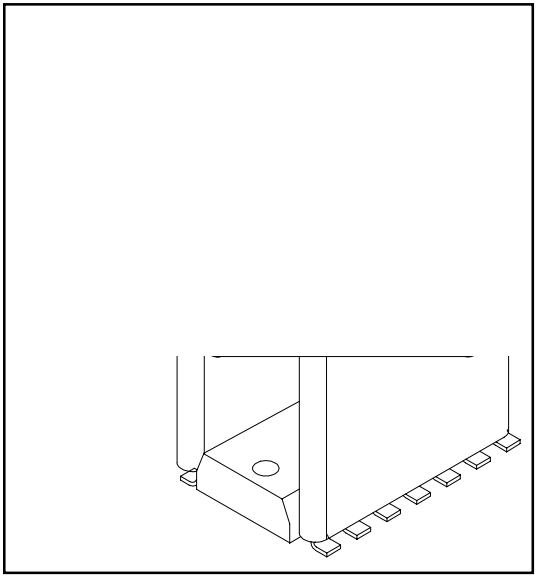

Figure 50.

TIMED MODE COMPONENT INSTALLATION (CONT'D)

NOTE
Any required preheating operating should be completed before advancing beyond this point.

11. Using the Vacuum Pick Adjust Control, adjust the height of the component relative to the nozzle as desired. PACE recommends that:

    The bottom of the nozzle should be positioned 1mm (0.040") above the PCB when using Box or Pattern nozzles.

    BGA components are to be positioned fully into the nozzle. The walls of the V-A-N nozzles will contact the component body.

12. Lower nozzle (with component) to a point where the component leads/contacts rest gently on or just above the component land pattern.

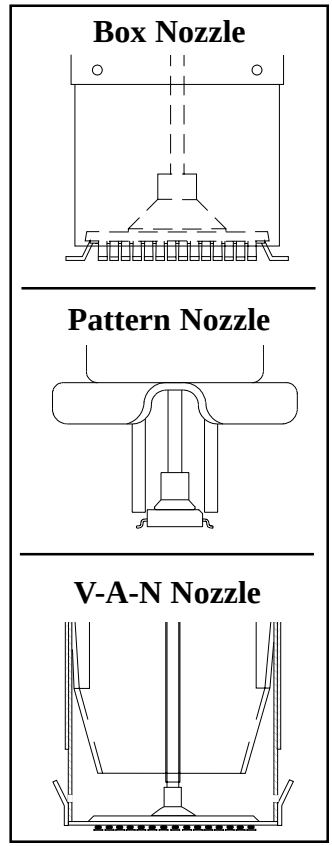

Figure 51.

NOTE
If component has been previously positioned on land pattern, lower any Box or Pattern nozzle to a height of 1mm (.040") above the PCB.

TIMED MODE COMPONENT INSTALLATION (CONT'D)

13. Ensure that the handpiece is held vertical to the PCB.

14. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.

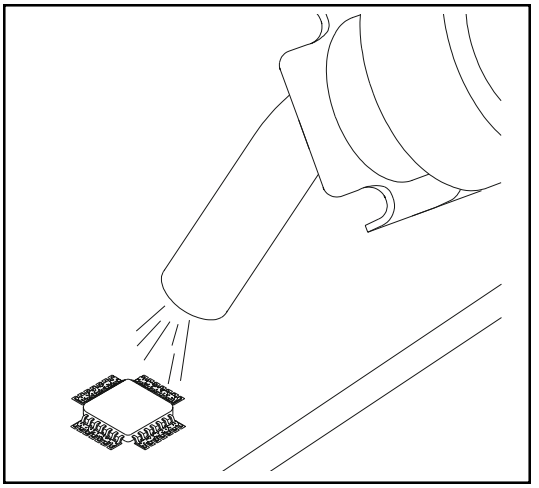

Figure 52.

15. Press and release the **CYCLE** Key or handpiece Cycle Switch to activate heat cycle.

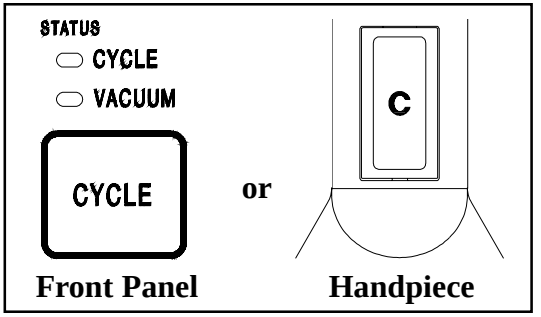

Figure 53.

TIMED MODE COMPONENT INSTALLATION (CONT'D)

16. If using a Single Jet nozzle in a hand held operation, move the handpiece as necessary to direct air flow to the solder areas requiring reflow.

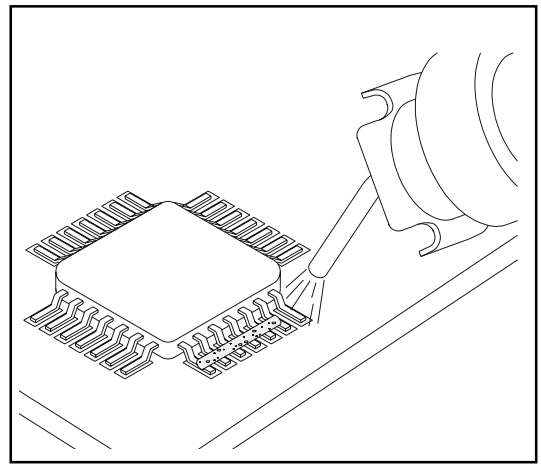

Figure 54.

17. The Digital Readout will display the actual air temperature (as it exits the heater) and the remaining cycle Reflow (“Reflo”) time counting down. At 5 seconds before the end of cycle, the vacuum (if activated in step 8) will automatically terminate and release the component and 5 beep noises will sound until the cycle ends.

18. When cycle is complete, lift the handpiece from the PCB.

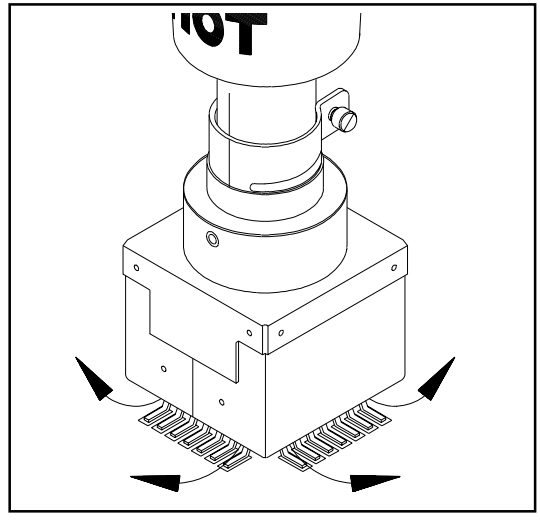

Figure 55.

Program Mode

The Program Mode of operation (Program Mode Light illuminated) utilizes user developed rework profiles previously stored in memory. The user recalls and uses the stored profile to produce consistent, repeatable results. Four profile stages can be programmed: preheat, soak, reflow and cool down. This allows you to emulate the production process.

PROGRAM MODE COMPONENT REMOVAL

1. If the unit is being used with the handpiece mounted on the ThermoFlo work platform, install the PCB on the work platform, in the Work Holder or the optional HS 200 preheating unit. Position PCB with the component to be removed directly beneath and squared to the nozzle.

NOTE
If the HS 200 Heat Wave system is being used for preheating, ensure that the system is properly set up (with a control cable connected between the Heat Wave Power source and the Heat Wave Connector on the rear panel of the ThermoFlo power source) and preheater is at the proper temperature.

2. Set the unit POWER Switch (on rear panel of power source) to the ON position.

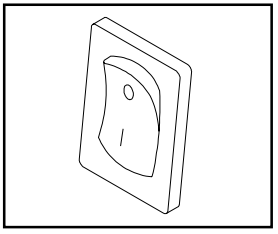

Figure 56.

3. Install the proper Nozzle Assembly and Vacuum Cup onto the handpiece. Ensure that the PCB assembly to be reworked and any replacement component have been properly prepared. Refer to the “General Process Guidelines” portion of this manual.

4. Ensure that the ThermoFlo unit is in the PROGRAM Mode of operation (**PROGRAM** Mode Light illuminated). Press and release **MODE/ESC** Key as necessary.

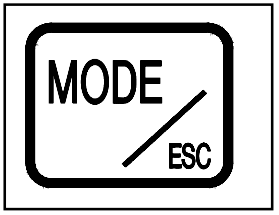

Figure 57.

PROGRAM MODE COMPONENT REMOVAL (CONT'D)

5. The Digital Readout will now display a “Profile =“ message with the current profile number. To select the profile number you wish to use, do one of the following:

   a) Press and release the **STEP** Key to advance to the next higher profile number.

   b) Press and release the **BACK** Key to advance to the next lower profile number.

NOTE
a & b will not work if "Profile = _ _".

or

a1) Press and release the **RECALL** Key.

b1) A “Recall - -” message will now be displayed.

c1) Enter the desired 2 digit profile number.

d1) Press and release the **ENTER** Key.

NOTE
The Timed Mode Remove Light will now be illuminated. A Save Current Profile? message may be displayed on the Digital Readout if the last profile used was not stored in memory. If so, press and release the **YES** or **NO** Key at this point. Use the YES Key if you have entered a new profile or changed a profile you wish to save. Additional message displays will step you through the save process.

6. Adjust the vacuum cup to a point where the bottom of the vacuum cup is flush with the bottom edge of the nozzle using the Vacuum Pick Adjust Control.

7. Lower the nozzle to a point .76-1.27mm (.030-.050”) above the PCB when using Box or Pattern nozzles. Lower the nozzle to contact a BGA component.

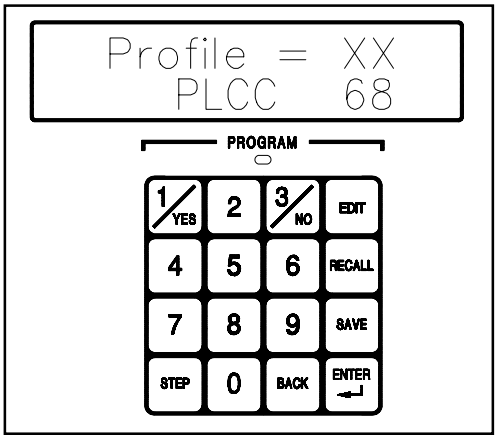

Figure 58.

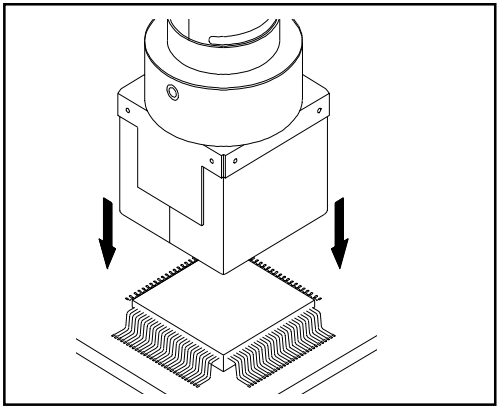

Figure 59.

PROGRAM MODE COMPONENT REMOVAL (CONT'D)

8. Press and release the **CYCLE** Key or Cycle Switch (on handpiece).

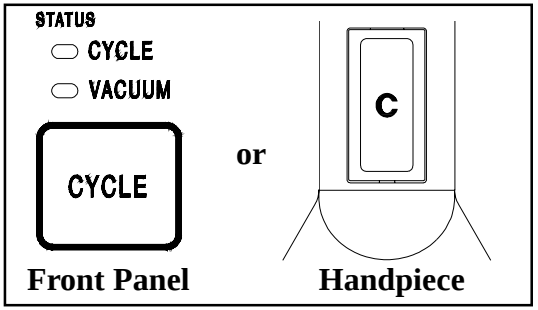

Figure 60.

9. If the selected profile includes a lower preheat cycle, the Digital Readout will display "HeatWave = XXX°" (set preheat temperature). Check the temperature of the Heat Wave system (Digital Readout on Heat Wave power source front panel).

   If the Heat Wave is at temperature:

   Press and release the **YES** Key. The cycle will now activate and automatically step through the profile.

   If the Heat Wave is not at temperature:

   Wait until the Heat Wave reaches set temperature, then press and release the **YES** Key to activate the cycle.

   or

   Press and release the **NO** Key, then repeat steps 8 & 9 after the Heat Wave reaches set temperature.

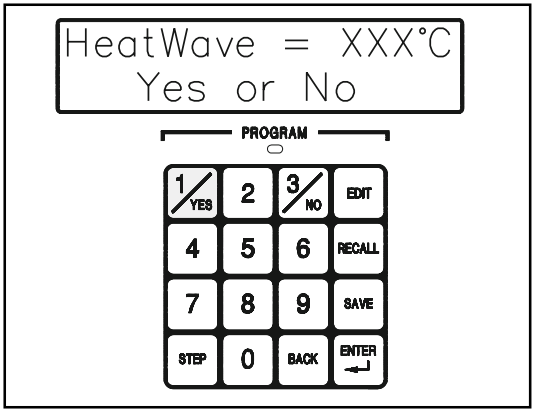

Figure 61.

NOTE

Once the cycle is initiated, the cycle can be quickly terminated at any time by simply pressing and releasing the **CYCLE** Key or Cycle Switch (on handpiece).

10. The unit will now cycle through the programmed profile and display the step (e.g., top preheat, reflow, soak, cool down), temperature and count down time. At the end of each step in the process, the unit will sound a beep tone.

PROGRAM MODE COMPONENT REMOVAL CONT'D)

11. During the reflow step, the vacuum to the handpiece will activate. The time of activation will be at a point 5 seconds before the end of the reflow step.

12. To alert the operator, when the cycle reaches a point 5 seconds before the end of the reflow process, a beep tone will sound every 1 second until the end of reflow.

13. If the programmed profile contains a Cool Down step, it will occur immediately after the reflow step. Allow the Cool Down step to time out

14. When cycle is complete, lift the handpiece from the PCB.

15. Depress and hold the Vacuum Pick Switch for 1/2 second (minimum) to deactivate vacuum and release component onto a heat resistant surface.

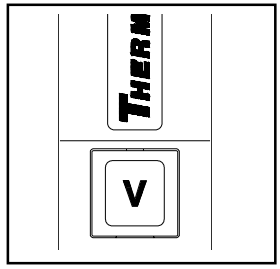

Figure 62.

WARNING
The component is HOT! DO NOT remove or catch the component with bare hands. Allow the component to drop onto the heat resistant surface. Allow sufficient time for the component and PCB to cool to room temperature before handling.

PROGRAM MODE COMPONENT INSTALLATION

1. If the unit is being used with the handpiece mounted on the ThermoFlo work platform, install the PCB on the work platform, in the Work Holder or the optional HS 200 preheating unit. Position PCB with the component land pattern directly beneath and squared to the nozzle.

NOTE
If the HS 200 Heat Wave system is being used for preheating, ensure that the system is properly set up (with a control cable connected between the Heat Wave Power source and the Heat Wave Connector on the rear panel of the ThermoFlo power source) and preheater is at the proper temperature.

2. Set the unit POWER Switch (on rear panel of power source) to the ON position.

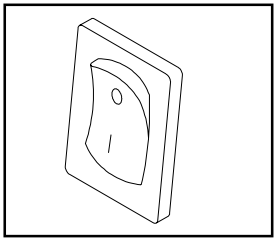

Figure 63.

3. Install the proper Nozzle Assembly and Vacuum Cup onto the handpiece. Ensure that the PCB assembly to be reworked and any replacement component have been properly prepared. Refer to the "General Process Guidelines" portion of this manual.

4. Adjust the vacuum cup up into the nozzle using the Vacuum Pick Adjust Control.

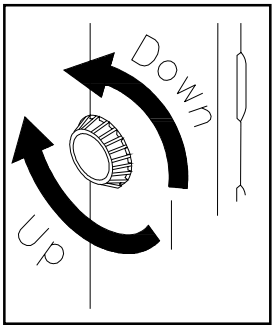

Figure 64.

PROGRAM MODE COMPONENT INSTALLATION (CONT'D)

5. The Digital Readout will now display “Profile =“ with the current profile number. To select the profile number you wish to use, do one of the following:
   a) Press and release the **STEP** Key to advance to the next higher profile number.
   b) Press and release the **BACK** Key to advance to the next lower profile number.

NOTE
a & b will not work if "Profile = _ _".

or

a1) Press and release the **RECALL** Key.

b1) A “Recall - -” message will now be displayed.

c1) Enter the desired 2 digit profile number.

d1) Press and release the **ENTER** Key.

NOTE
The Timed Mode Install Light will now be illuminated. "Save Cur Profile?" may be displayed on the Digital Readout if the last profile used was not stored in memory. Press the **NO** Key at this point.

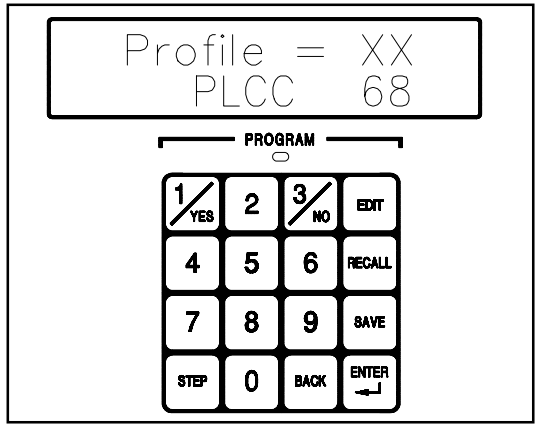

Figure 65.

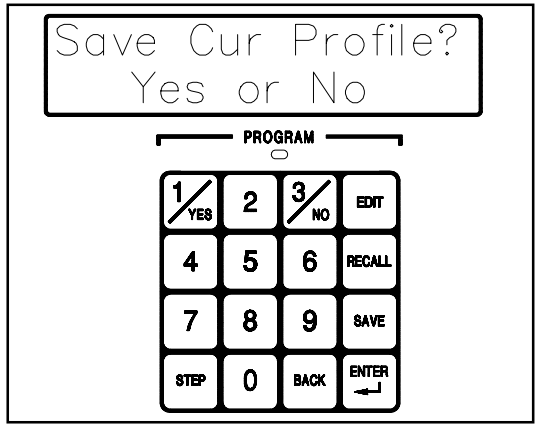

Figure 66.

PROGRAM MODE COMPONENT INSTALLATION (CONT'D)

6. Place component under (Pattern) or into (Box or V-A-N) nozzle.

7. Lower Vacuum Cup down onto component body.

8. Depress and release the Vacuum Pick Switch (on handpiece) to activate vacuum and grasp component. Adjust component height as desired for best results.

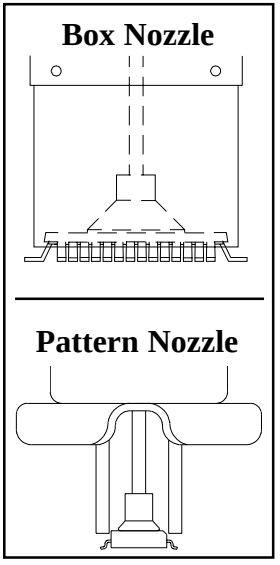

Figure 67.

9. Lower the component to a point just off the PCB land pattern.

10. Ensure that the ThermoFlo unit is in the PROGRAM Mode of operation (**PROGRAM** Mode Light illuminated). Press and release **MODE/ESC** Key as necessary.

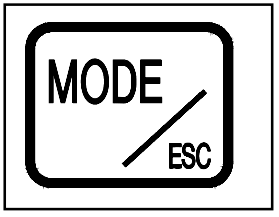

Figure 68.

11. Press and release the **CYCLE** Key or Cycle Switch (on handpiece).

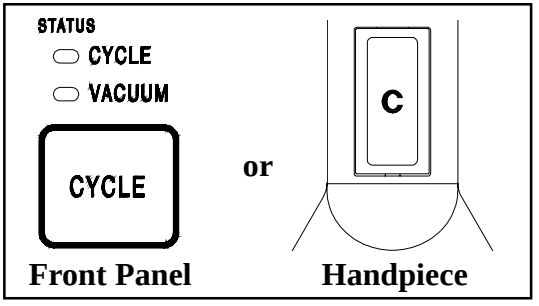

Figure 69.

PROGRAM MODE COMPONENT INSTALLATION (CONT'D)

12. If the selected profile includes a lower preheat cycle, the Digital Readout will display "HeatWave = XXX°" (set preheat temperature). Check the temperature of the Heat Wave system (Digital Readout on Heat Wave power source front panel). If the Heat Wave is at temperature, press and release the **YES** Key. The cycle will now activate and automatically step through the profile. If the Heat Wave is not at temperature:
    Wait until the Heat Wave reaches set temperature, then press the **YES** Key to activate the cycle.

    or

    Press and release the **NO** Key, then repeat steps 11 & 12 after the Heat Wave reaches set temperature.

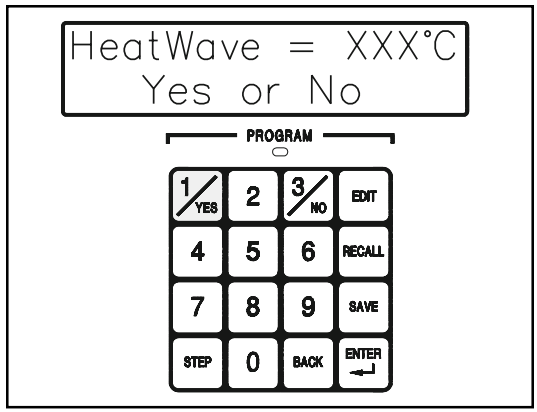

Figure 70.

NOTE
Once the cycle is initiated, it can be quickly terminated at any time by simply pressing the **CYCLE** Key or Cycle Switch (on handpiece).

13. The unit will now cycle through the programmed profile and display the step (e.g., top preheat, reflow, soak, cool down), temperature and count down time. At the end of each step in the process, the unit will sound a beep tone. To alert the operator, when the cycle reaches a point 5 seconds before the end of the reflow process, a beep tone will sound every 1 second until the end of reflow.

14. During the reflow step, the vacuum will activate automatically before the end of the reflow step as determined by the profile (5 seconds minimum before end of reflow).

15. If the programmed profile contains a Cool Down step, it will occur immediately after the reflow step. Allow the Cool Down step to time out

NOTE
Allow sufficient time for the component and PCB to cool to room temperature before handling.

16. When profile cycle is complete, lift the handpiece from the PCB.

Entering/Editing A Profile

The ThermoFlo unit allows the user to store user-defined profiles, including parameters for preheat, soak, reflow and cool down. Any previously stored profiles can be changed quickly and easily using this procedure.

When entering a new profile, you can begin by using a similar previously stored profile. Make the appropriate changes and store the new profile under a new profile storage number. See step 2.

When editing (changing) a profile previously stored in memory, you must recall the program you wish to change, then edit the profile. See step 2.

Use the following procedure to enter a profile into system memory or to change a stored profile.

NOTE

The illustrations used in the following procedure display messages with all temperature references shown in °C, components as “PLCC” and numerical values as “X” (user defined). The **1/YES** and **3/NO** Keys are described simply as **YES** and **NO** for clarity of instruction.

The unit may display a message of “Enter Password” if a password has been stored in memory. Enter the 4 key password sequence when this message is displayed.

1. Press and release the **MODE** Key until the **PROGRAM** Mode Light illuminates.

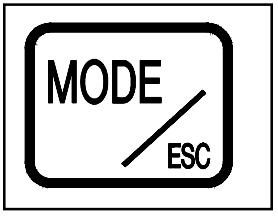

Figure 71.

NOTE

The procedure may be exited at any time using the **MODE/ESC** Key. If any changes have been made to the profile being edited, the Digital Readout will display a message asking if you wish to save these changes. Ultimately, "Exit Edit Mode ?" will be displayed. Press the YES Key to exit the editing procedure.

2. The Digital Readout will now display a stored profile number or “Profile = - -” plus the component type and number of solder connections. You can simply press and release the **EDIT** Key to edit a profile

   or

   a) Press and release the **RECALL** Key (display will read “Recall - -”)

   b) Enter the desired profile number

   c) Press and release the **ENTER** Key then the **EDIT** Key.

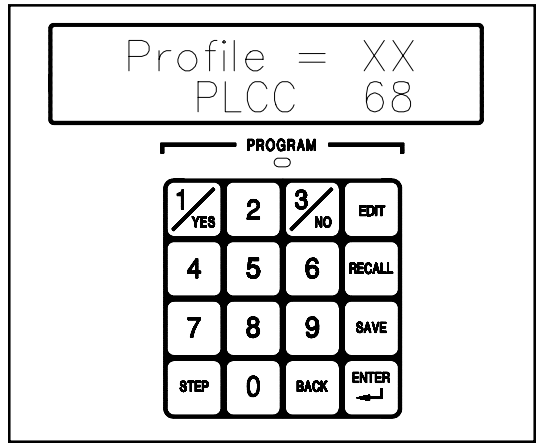

Figure 72.

NOTE

If the program number you have entered does not contain a stored profile, "No Profile In Memory" will be displayed. Simplyselect a stored profile number, then press and release the **RECALL** Key to try again. Press and release the **EDIT** Key.

If "Save Cur Profile?" is displayed, press and release the **NO** Key then press and release the **EDIT** Key. Take note of the profile number displayed on the Digital Readout. This number reference is important when performing step 29 of this procedure.

3. When in the Program Mode, either the Timed Mode Remove Light or Timed Mode Install Light will be illuminated and the Digital Readout will display a corresponding message. If this is the type of profile (Removal or Installation) you wish to store, press and release the **YES** Key. If not, press and release the **NO** Key to obtain the correct display for your profile, then press and release the **YES** Key.

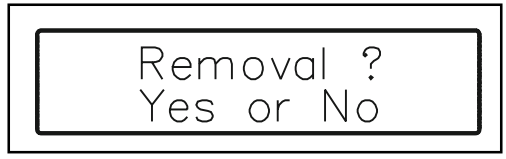

Figure 73.

NOTE

Whenever the “Yes or No? question is displayed, the **STEP** key may also be pressed and released (in the same manner as the **YES** Key) to move to the next step of profile storage.

Entering/Editing A Profile (Cont'd)

4. "Preheat On ?" (or "Preheat Off ?) is now displayed. Use the **YES** and **NO** Keys to select Preheat On or Off. If Preheat is set to Off, proceed to step 13.

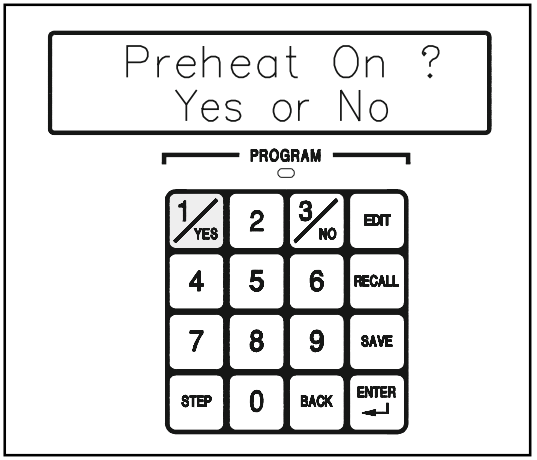

Figure 74.

5. "Low Preheat" is now displayed. Use the **YES** and **NO** Keys to select Lower Preheat On or Off. If Lower Preheat is set to Off, proceed to step 8.

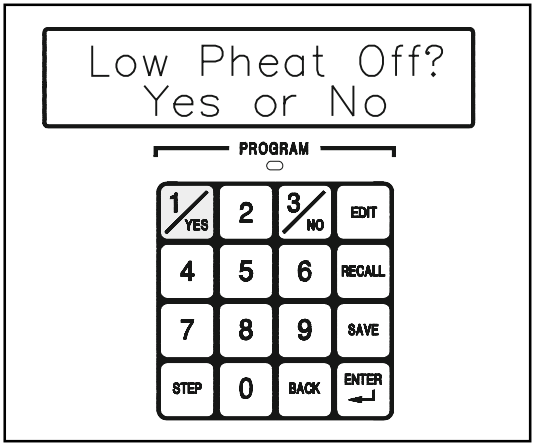

Figure 75.

NOTE

Profile parameters for lower preheat are entered at this point as a reference only. The temperature of the lower preheat is controlled by the Heat Wave power source. The ThermoFlo unit controls the activation of the Heat Wave motor pump only through the Heat Wave Interface Cable. This cable must be installed between the ThermoFlo unit and the Heat Wave power source to provide motor pump control.

6. "Lower Preheat Time" is now displayed. A number depicting the amount of time in seconds is also displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number. Always enter 3 numbers to obtain the desired time. If entering a figure of less than 100, you must enter a total of 3 numbers. For example, enter 65 seconds as 065. Press and release the **STEP** Key.

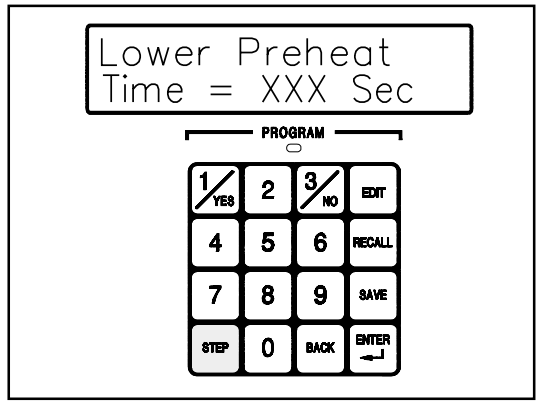

Figure 76.

NOTE

The minimum time setting for all time parameters, except Vacuum Release (5 seconds minimum) is 10 seconds. If a lower time is entered, the setting will change to "10 Sec" when the **STEP** Key is actuated. Enter the time desired, then press and release the **STEP** Key again to continue.

7. "Lower Preheat Temp =" is now displayed. A number depicting the desired bottom preheat temperature (in degrees C or F as selected in the Set-Up Mode) is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the desired temperature. Always enter 3 numbers (including any zeroes) to obtain the desired temperature. Press and release the **STEP** Key.

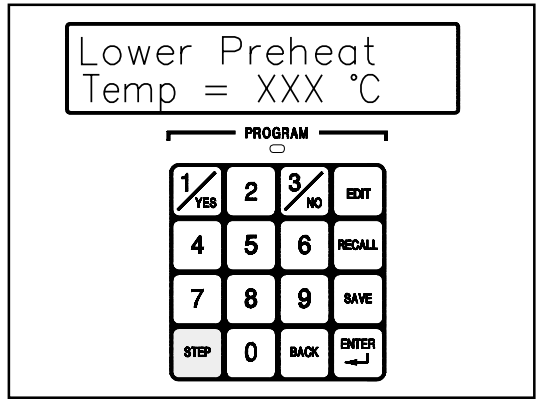

Figure 77.

Entering/Editing A Profile (Cont'd)

8. "Top Preheat" is now displayed. Use the **YES** and **NO** Keys (as in step 6) to select Top Preheat On or Off. If Top Preheat is set to Off, proceed to step 13.

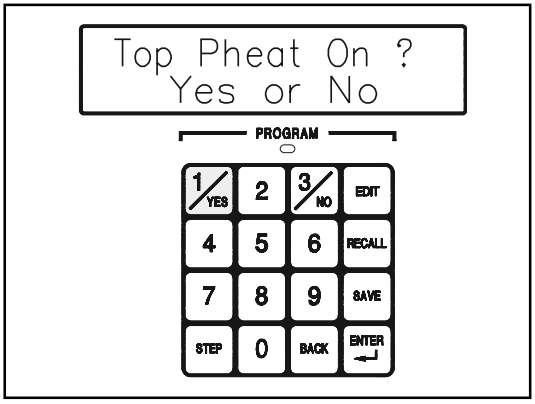

Figure 78.

9. "Top Preheat Time" is now displayed. A number depicting the amount of time in seconds is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number (10 seconds minimum). Always enter 3 numbers to obtain the desired time. Press and release the **STEP** Key.

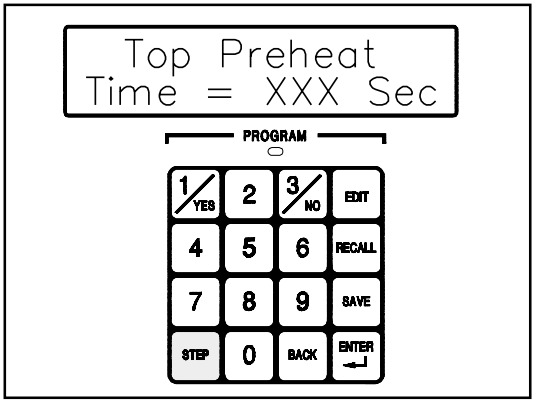

Figure 79.

10. "Top Preheat Temp" is now displayed. A number depicting the desired top preheat temperature (in degrees C or F as selected in the Set-Up Mode) is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the desired temperature. Always enter 3 numbers (including any zeroes) to obtain the desired temperature. Press and release the **STEP** Key.

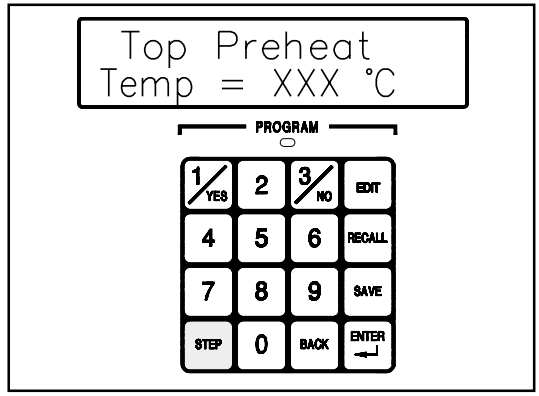

Figure 80.

11. "Top Pheat Start Time" is now displayed. This is the time delay at the beginning of a preheat cycle (the Lower Preheat, if used, is already on) before the top preheat begins. A number depicting the amount of delay ("Start Time") in seconds is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number (10 seconds minimum). Always enter 3 numbers to obtain the desired time. Press and release the **STEP** Key.

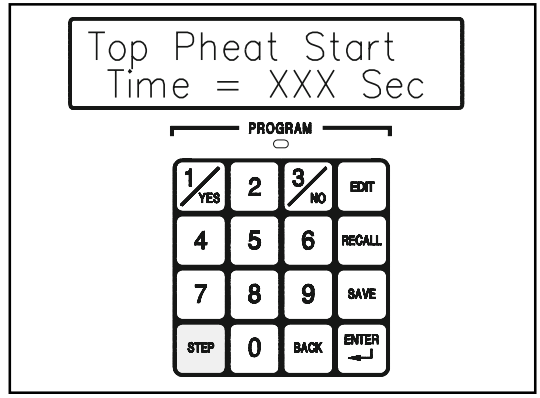

Figure 81.

12. "Top Preheat Blower =" is now displayed. A number depicting the desired blower speed (1-9) is on the bottom line of the Digital Readout. Use the numbered keys to enter the desired number. Press and release the **STEP** Key.

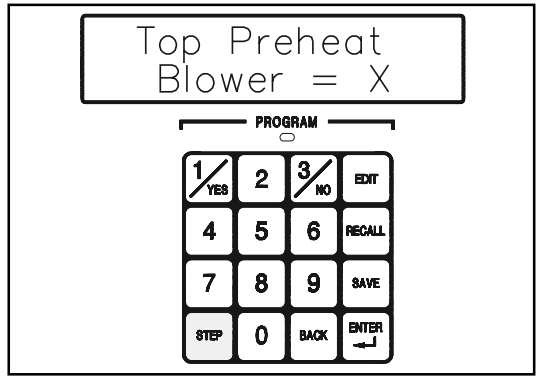

Figure 82.

Entering/Editing A Profile (Cont'd)

13. "Soak On" (or "Soak Off") is now displayed. Use the **YES** and **NO** Keys to select Soak On or Off. If Soak is set to Off, proceed to step 17.

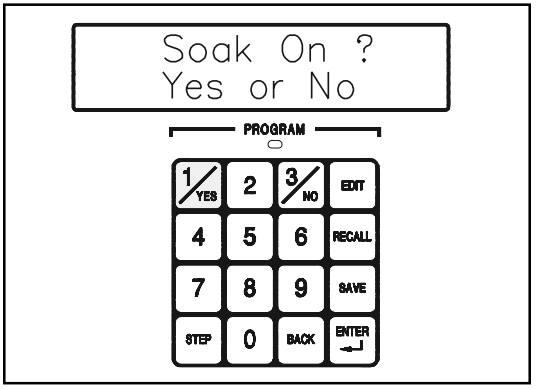

Figure 83.

14. "Soak Time =" is now displayed. A number depicting the amount of time in seconds is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number (10 seconds minimum). Always enter 3 numbers (including any zeroes) to obtain the desired time. Press and release the **STEP** Key.

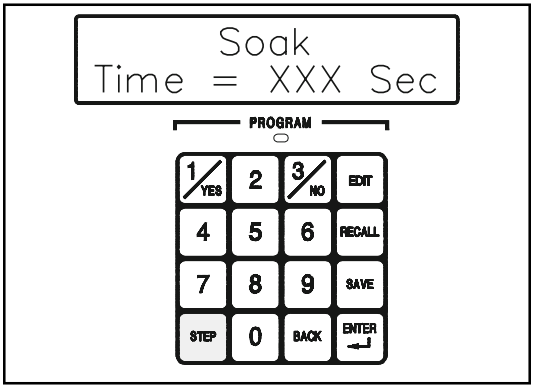

Figure 84.

15. "Soak Temp" is now displayed. A number depicting the desired Soak temperature is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number. Use the numbered keys to enter the desired temperature. Always enter 3 numbers (including any zeroes) to obtain the desired temperature. Press and release the **STEP** Key.

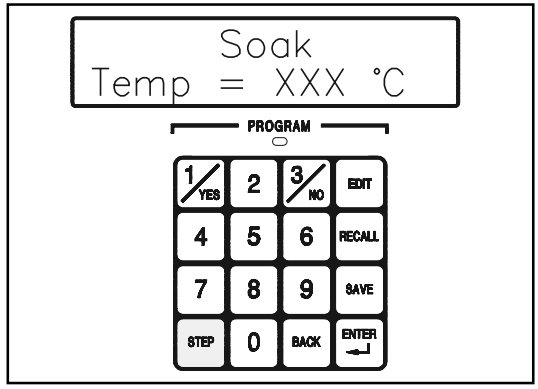

Figure 85.

16. "Soak Blower =" is now displayed. A number depicting the desired blower speed (1-9) is shown on the bottom line of the Digital Readout. Use the numbered keys to enter the desired number. Press and release the **STEP** Key.

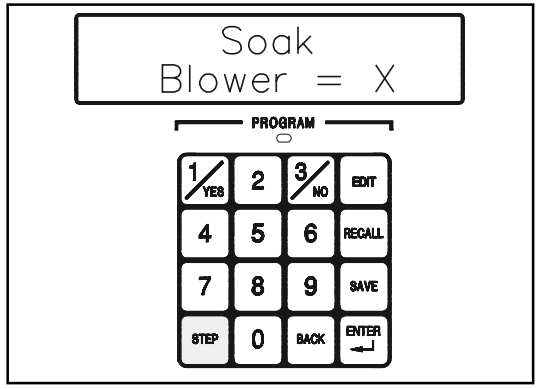

Figure 86.

17. "Reflow On?? (or "Reflow Off") is now displayed. Use the **YES** and **NO** Keys to select Reflow On or Off. If Reflow is set to Off, proceed to step 23.

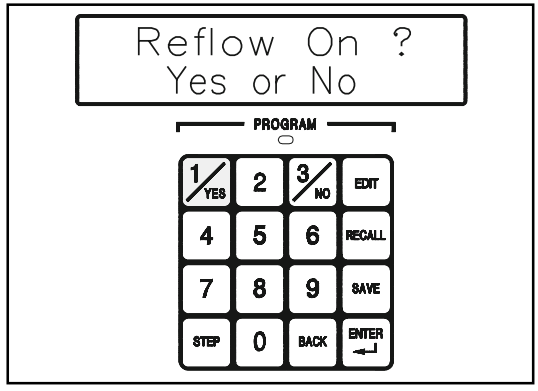

Figure 87.

Entering/Editing A Profile (Cont'd)

18. "Reflow Time =" is now displayed. A number depicting the amount of time in seconds is shown on the bottom line of the Digital Readout. Use the numbered keys to enter the desired time (10 seconds minimum). Always enter 3 numbers to obtain the correct display. Press and release the **STEP** Key.

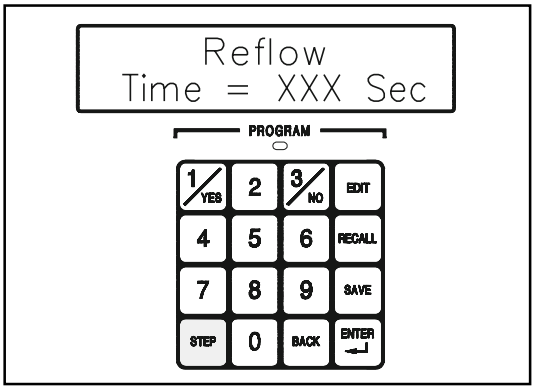

Figure 88.

19. If the Profile being entered/changed is a Removal profile, proceed to step 20. A"Vacuum Release Time =" is now displayed if the Profile being entered (or changed) is an Installation profile. A number depicting the amount of time (in seconds) into the Reflow cycle before the vacuum stops (to drop the component on the PCB). Use the numbered keys to enter the correct number (5 seconds minimum and must be at least 5 seconds less than the Reflow cycle time). Always enter 3 numbers to obtain the correct display. Press and release the **STEP** Key.

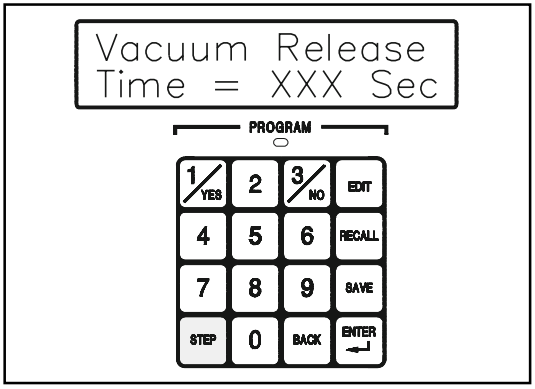

Figure 89.

20. "Reflow Temp =" is now displayed. A number depicting the desired top preheat temperature (in degrees C or F as selected in the Set-Up Mode) is shown on the bottom line of the Digital Readout. Use the numbered keys to enter the desired Reflow temperature. Always enter 3 numbers (including any zeroes) to obtain the desired temperature. Press and release the **STEP** Key.

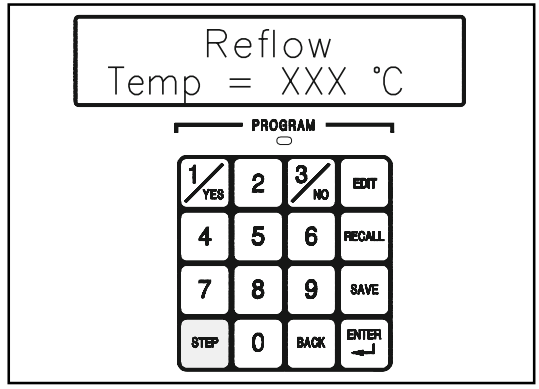

Figure 90.

21. "Reflow Blower =" is now displayed. A number depicting the desired blower speed (1-9) is shown on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number. Press and release the **STEP** Key.

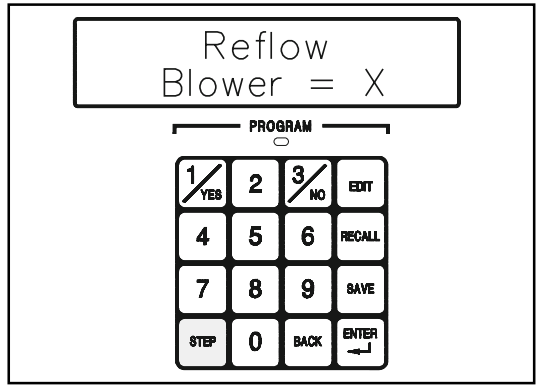

Figure 91.

22. "Lower Pump On? (or "Lower Pump Off?) is now displayed. Use the YES and NO Keys to select Lower Pump (from PACE Heat Wave preheat system) On or Off during the Reflow cycle.

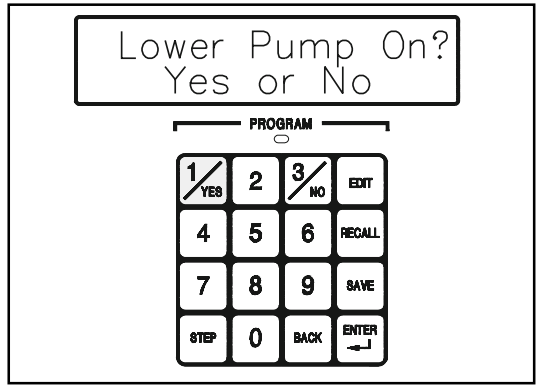

Figure 92.

Entering/Editing A Profile (Cont'd)

23. "Cool Down On?" (or "Cooldown Off?) is now displayed. Use the **YES** and **NO** Keys to select preheat On or Off. If Cool Down is set to Off, proceed to step 26.

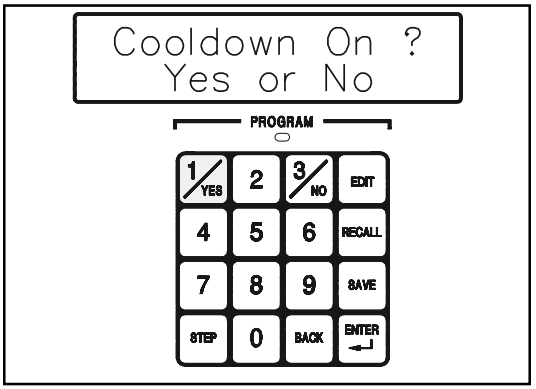

Figure 93.

24. "Cool Down Time =" is now displayed. A number depicting the amount of time in seconds is shown on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number (10 seconds minimum). Always enter 3 numbers (including any zeroes) to obtain the desired time. Press and release the **STEP** Key.

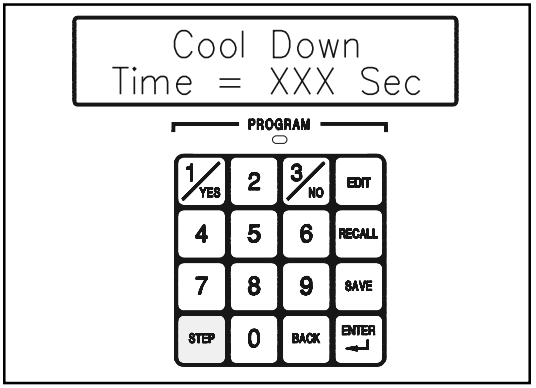

Figure 94.

25. "Cool Down Blower =" is now displayed. A number depicting the desired blower speed (1-9) is shown on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number. Press and release the **STEP** Key.

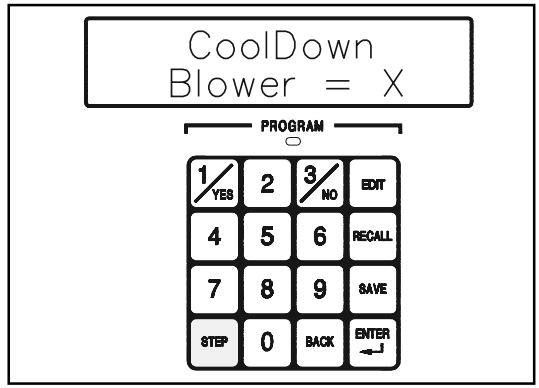

Figure 95.

26. "Component = " is now displayed. Use the **YES** and **NO** Keys to select the Component. Press and release the **NO** Key until the proper component description (for the profile) is displayed. When the proper component is displayed, press and release the **YES** Key. If a proper description does not appear on the display, simply select “Other”, then press and release the **YES** Key.

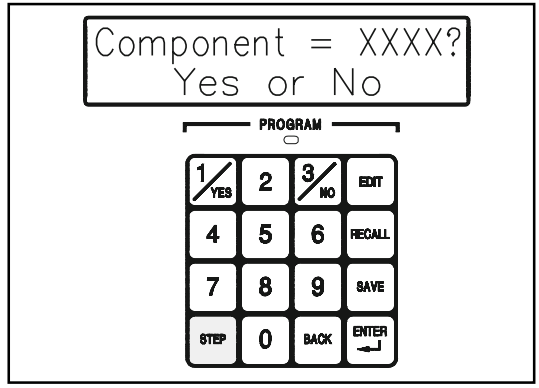

Figure 96.

A number depicting the number of component solder connections is now displayed on the bottom line of the Digital Readout. Use the numbered keys to enter the correct number of pins. Always enter 3 numbers to obtain the correct display.

27. Press and release the **STEP** Key.

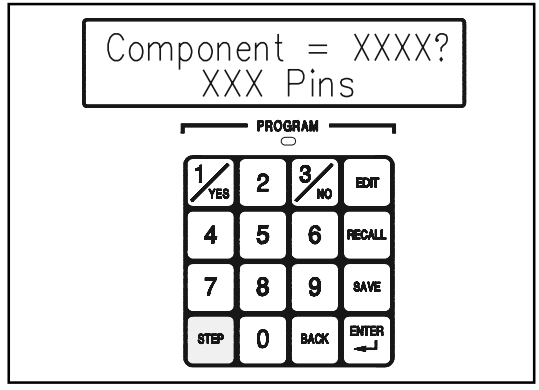

Figure 97.

Entering/Editing A Profile (Cont'd)

28. "Save Profile?" is now displayed. Use the **YES** Key to save changes to the profile. If you do not wish to save the profile, press and release the **NO** Key and proceed to step 31.

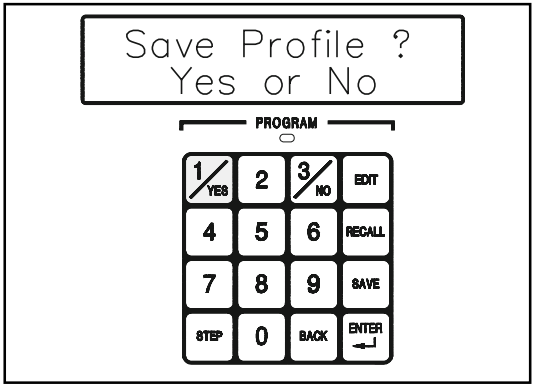

Figure 98.

29. "Update Same Profile?" is now displayed.

    Use the **YES** Key to update the existing profile, then proceed to step 32.

    Use the **NO** Key if you wish to save changes as a new profile.

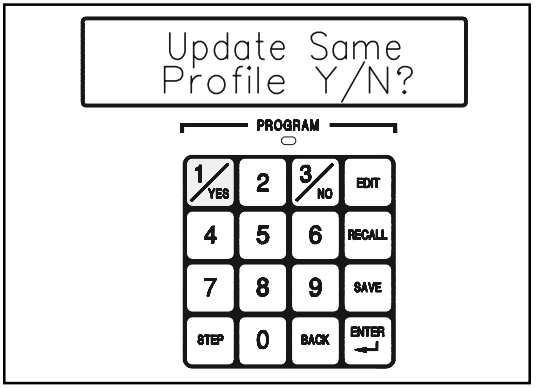

Figure 99.

NOTE

If you save this profile by pressing the **YES** Key, it will replace the profile that was displayed on the Digital Readout when you pressed and released the **EDIT** Key (see NOTE following step 1). If you wish to keep the original profile recalled in step 1, press the **NO** Key.

30. "Save Profile"is now be displayed. This is the next storage area number which currently has no stored profile. If you wish to store the profile under this number, press and release the **ENTER** Key. If you wish to use another profile number, enter the 2 digit number using the numbered keys. Press and release the **ENTER** Key to save and proceed to step 32.

NOTE
If you choose a number other than the next available storage number, be careful to use an unused number. If you enter a currently used number by mistake, the display will ask you if you wish to replace the currently stored profile.

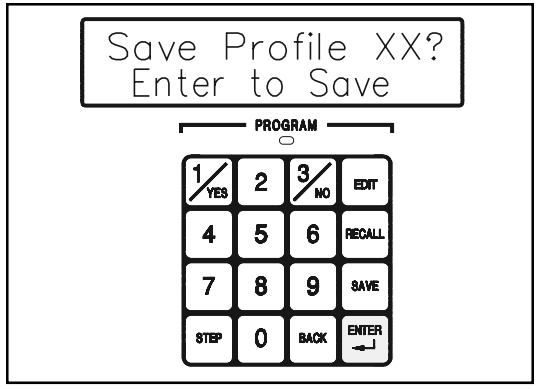

Figure 100.

31. "Exit Edit Mode?" is now displayed. Use the **YES** Key to exit the mode. If you do not wish to exit, press and release the **NO** Key and proceed to step 3 to change any parameter previously stored. In many of the previously described scenarios, this step is bypassed.

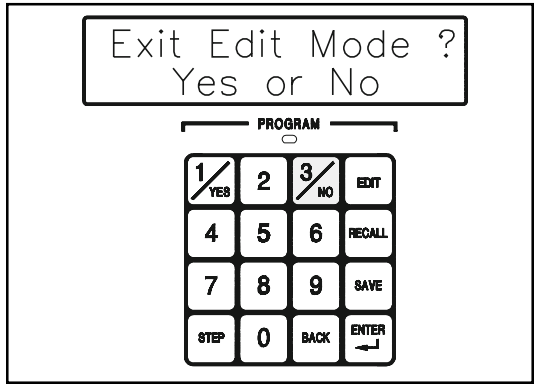

Figure 101.

32. "Profile =" is now be displayed. The user can now select the desired stored profile required for rework.

33. Refer to the Program Mode portion of the Operation section of this manual for instructions on operating the unit in Program Mode.

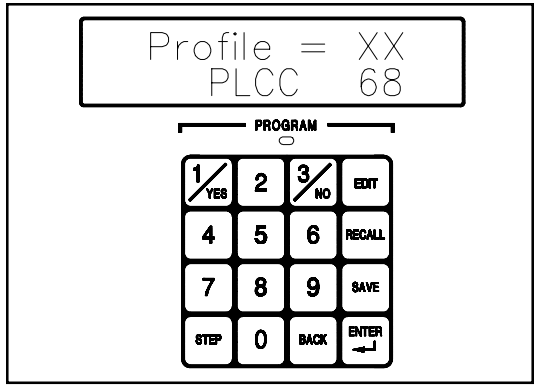

Figure 102.

Introduction

In Set-Up Mode you can:

1. Install, remove or change a password.
2. Set the Temperature scale to °C or °F as desired.
3. Delete stored profiles.

Use the following procedure to enter the Set-Up mode and make any changes.

Entering Set-Up Mode

1. Set the Power Switch to the Off (“0”) position.

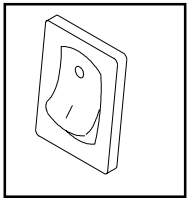

Figure 103.

2. Press and hold the **ENTER** key while switching the Power Switch to the On (“1”) position. The Digital Readout will now display a version message and change to read Password Needed ?

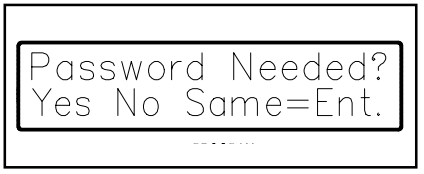

Figure 104.

3. Release the **ENTER** key.

NOTE
If a password is currently stored in memory, “Enter Password” will be displayed. Enter the 4 key numerical password sequence to continue.

4. Perform one of the following steps:

   a) If you would like to retain the "Same" password (if previously stored, press and release the **ENTER** Key. Proceed to step 6.

   b) If you do not wish to have a stored password, press and release the **NO** Key. Proceed to step 10.

   c) If you would like to install a new password, press and release the **YES** Key.

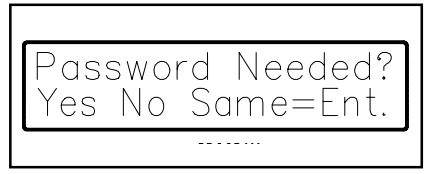

Figure 105.

5. The display will now read "Enter New Password". Use the numbered keys only to enter any 4 digit (numbered) sequence! **Be sure to make note of the password you entered.**

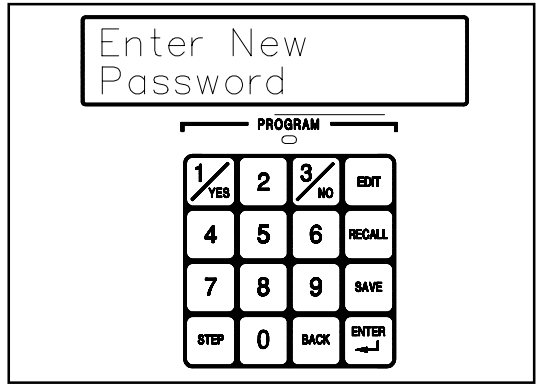

Figure 106.

NOTE

As the first three selected number keys are entered, an asterisk will appear on the Digital Readout. These same asterisks also appear when entering a password during operation.

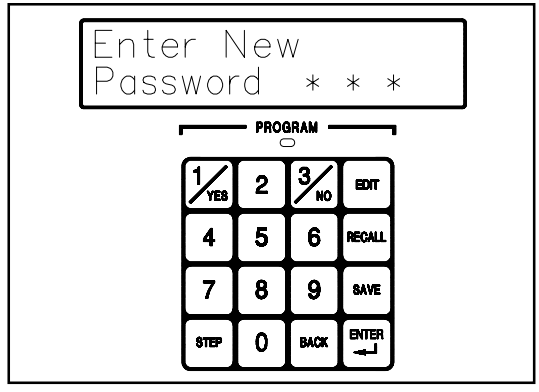

Figure 107

Locks

6. "Lock Mode ?" is now displayed. Press and release the **YES** Key if you want the unit to require a password to change modes of operation.

   Press and release the **NO** Key if you want the operator to be able to change operation modes without entering a password.

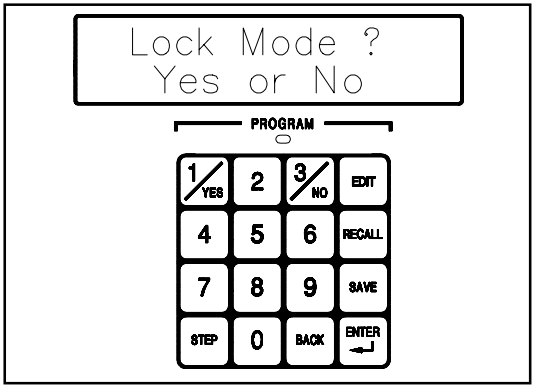

Figure 108.

7. "Lock Edit ?" is now displayed. Press and release the **YES** Key if you want the unit to require a password entry to edit profiles in Program Mode. Press and release the **NO** Key if you want the operator to be able to edit profiles without entering a password.

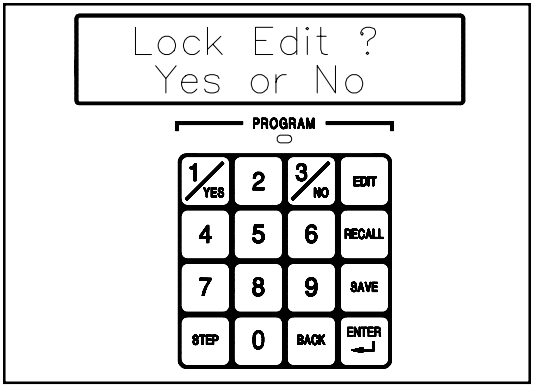

Figure 109.

8. "Lock Keys ?" is now displayed. If the Lock Keys is activated, a password use will be required before allowing use of any of the scroll keys in the Manual and Timed Modes and the **STEP** and **RECALL** Keys in the Program Mode.

   Press and release the **YES** Key if you want the unit to require a password before using any of the keys.

   Press and release the **NO** Key if you want the operator to be able to use the keys without entering a password.

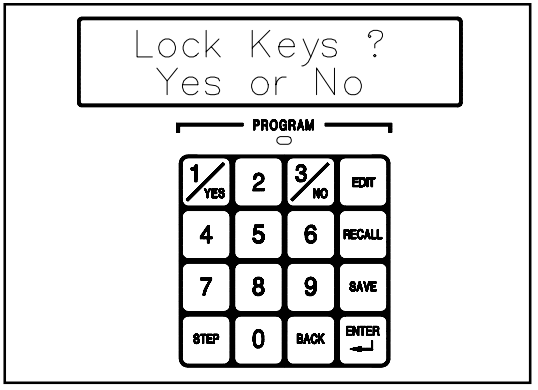

Figure 110.

9. "Display is" (°C or °F) is now displayed.

   Press and release the **YES** Key if you want all temperature displays to read in that scale (°C or °F).

   Press and release the **NO** Key if you wish to change the temperature scale; the display will change to the other scale. Press and release the **YES** Key when the desired temperature scale appears.

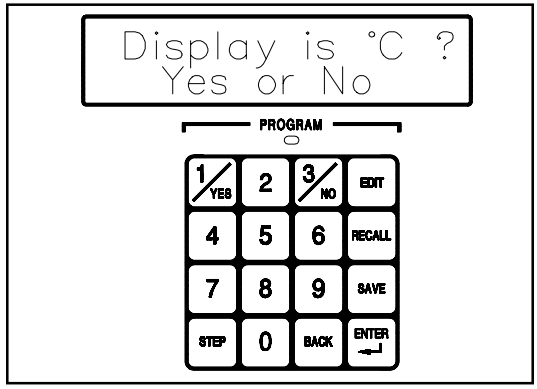

Figure 111.

Profile Deletion

10. "Delete Profiles ?" is now displayed.

    Press and release the **YES** Key if you want to delete stored profiles.

    Press and release the **NO** Key if you do not wish to delete any stored profiles. Proceed to step 14.

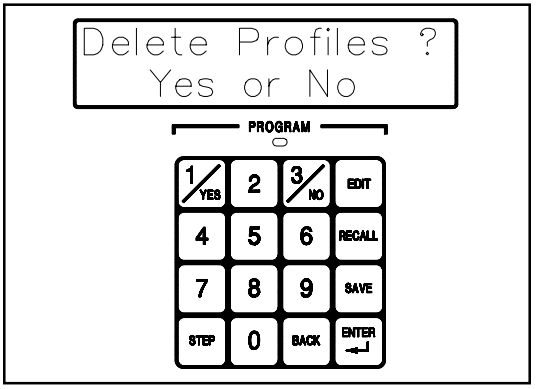

Figure 112.

11. "Delete Profiles ? Number - -" is now displayed. Enter the number of the profile you wish to delete.

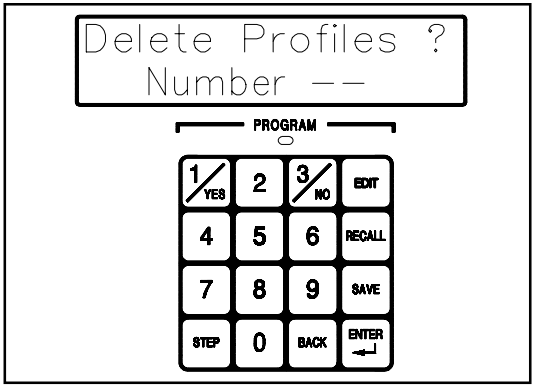

Figure 113.

12. “Are You Sure ?” is now displayed:

    Press and release the **YES** Key if you want to delete this profile. All information on this Profile will be permanently deleted.

    Press and release the **NO** Key if you do not wish to delete this profile.

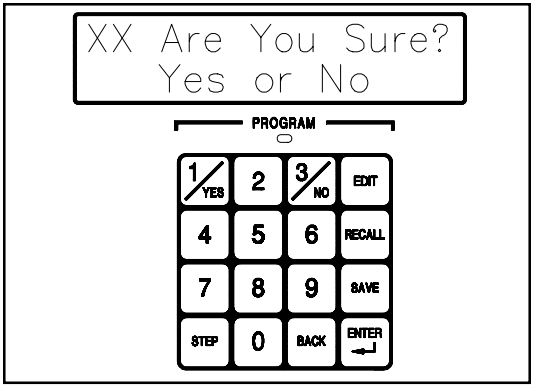

Figure 114.

13. “Delete Profiles ?” is now displayed as in step 10.

    Press the **YES** Key and repeat steps 10 through 13 to delete any additional profiles.

    Press the **NO** Key if you do not wish to delete any more profiles.

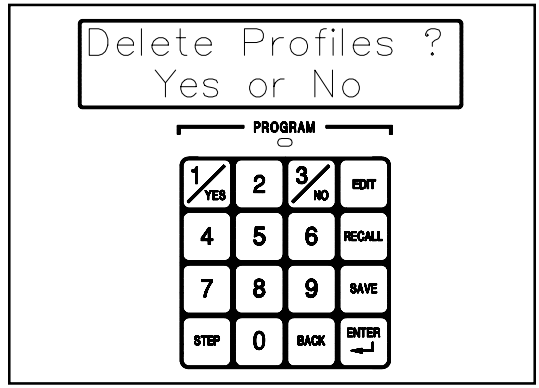

Figure 115.

14. "Exit Setup ?" is now displayed.

    Press the **YES** Key to exit.

    If you do not wish to exit, press and release the **NO** Key and proceed to step 4 to change any parameter previously stored.

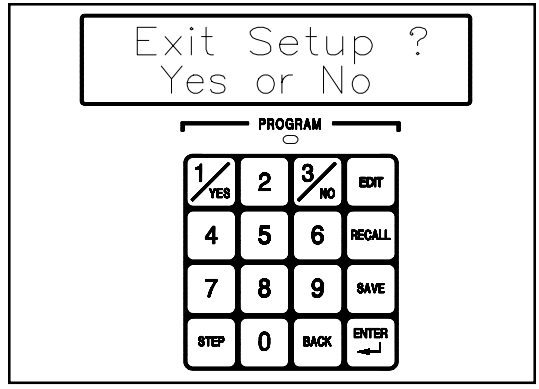

Figure 116.

Calibration

Calibration should be performed annually to maintain accuracy of the ThermoFlo unit. Contact PACE (see page iv) for information.

Digital Readout Message Codes

Listed below are message codes which may be displayed on the Digital Readout if a mistake is made by the operator (e.g., wrong password entry) or if the system has malfunctioned.

DISPLAY MESSAGE	DESCRIPTION
Wrong Password	The incorrect Password has been entered. The displayed message will time out after 3 seconds and revert to normal operation. Enter the correct Password.
Handle Cooling Please Wait	Circuitry within the ThermoFlo prevents the handpiece from overheating. If this message is displayed, allow the handpiece to cool before resuming operation.
Open Sensor Error	The handpiece heater assembly sensor is open. Replace heater assembly.
Ground Fault Error	The ThermoFlo has detected a ground fault in the handpiece. Check the GFI Light on the rear panel. If the light is out, turn power off and then back on. If the GFI light is still out, a ground fault has been detected. Contact PACE Customer Service for assistance.
Blower Run Error	The power source blower unit is not running. Contact the PACE Service Department for assistance.
The PACE Service department can be reached at: Tel. (301) 490-9860 1-888-535-PACE (Toll Free)	

Table 1. Digital Readout Message Codes

Unit

Most malfunctions are simple and easy to correct. Select the "Symptom" which best describes the malfunction and follow the steps given in the "Solution" column.

SYMPTOM	PROBABLE CAUSE	SOLUTION
No power to system.	Blown Fuse (F1).	Replace Fuse F1 located on the power source rear panel.
	Line cord unplugged.	Plug line cord into AC outlet.
Heater Assembly does not heat. No malfunction indicated on Digital Readout. Green GFI light is on.	Open Heater.	Contact PACE Service department for assistance.
Little or no air flow, heater heats and blower is running.	Kinked air hose.	Change routing of air hose to remove kinks.
Display on Digital Readout indicates a malfunction.		Refer to Digital Readout Message Codes, Table I.
Vacuum Cup will not hold component.	Worn or broken vacuum cup.	Replace vacuum cup.
Vacuum Pickup Rod binding.	Vacuum Pickup rod is bent.	Contact PACE Service Department for assistance.
For further assistance, contact the PACE Service Department at Tel. (301) 490-9860 1-888-535-PACE (Toll Free) FAX (301) 483-7030		

Table 2. Unit Corrective Maintenance